SCIENCE

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FRIDAY, SEPTEMBER 6, 1901.

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MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Professor J. McKeen Cattell, Garrison-on-Hudson, N. Y.

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

THE Denver meeting was notable in several particulars. It was feared that a meeting so far west would be poorly attended, but the registration reached 311, being larger than that of the second Detroit and Madison meetings, and nearly as large as that of the Columbus and fourth Buffalo meetings. The number of representative men of science was proportionally very large, so that the sectional meetings were well attended and were as full of interest as at larger meetings of the Association, more than 200 papers having been presented. In the registration Colorado led with 79 members, while the number of members residing west of the Mississippi reached 162.

The attitude of the citizens of Denver and of Colorado, as indicated by the press and by arrangements for the convenience and entertainment of members, was most happy. This is well indicated by the following extract from an editorial which appeared in the Denver *Post* of August 30:

It is believed that the visit of the scientists has been one of pleasure, as well as profit, and that if the people of Denver have taken a thorough satisfaction in their presence, they, on the other hand, have found equal satisfaction in their sojourn here. The public is too apt to think that because men devote their lives to the pursuit of scientific inquiries they are apt to be dry, self-absorbed and technical. To such as these actual contact with the members showed them to be surprisingly genial, kindly and sympathetic, while in many of them was found a fine flow of humor flavored with a wit which was none the less attractive because it carried with it no sting. In the nature of things it will be some years before Denver may again hope to entertain them as a body, but every one concerned will feel for them a regard amounting to affection, and when their next session is held here they will get a reception such as no other city could accord them.

The Denver meeting was also notable for several important changes in policy, either adopted or presented for future action. Perhaps the most radical measure under discussion was that which contemplates a change in the time of the annual meetings. The summer meeting has become so fixed a part of the annual program of many members that a change to midwinter will call for considerable readjustment. The movement for a general convocation week following the holiday week has commended itself so generally to universities, however, that the Association has concluded that the experiment deserves a trial. Accordingly, the general committee of the Denver meeting has suggested to its successor at Pittsburg that the annual meeting of 1903 be held in Washington during the week in which January 1 falls. This action simply suggests the experiment of a winter meeting, without any recommendation as to the discontinuance of summer meetings. It may be that the Association will conclude to hold two meetings a year, which could well be of somewhat different character.

An important amendment, which was adopted, provides for representation in the council from the affiliated societies. By this action, each affiliated society is entitled to elect one member, who is a fellow of the Association, as its representative in the council; and if the society contains more than twenty-five members who are fellows of the Association, it is entitled to two representatives in the council. It seems certain that this representation in the ruling body of the Association will lead to a more compact and efficient organization of the scientific interests of the country.

Another amendment was adopted, which provides that the council shall have power to change either the time or place of meeting. Heretofore, after the adjournment of the general committee, there has been no authority to make such changes upon any contingency. It is understood that this power will be exercised only in such extreme cases that the action will commend itself to all members. For example, the time set for the Denver meeting narrowly escaped a conflict with a national meeting of such magnitude that the Association could not have been accommodated.

Three amendments were presented to be acted upon at the Pittsburg meeting, which look to much greater efficiency in the conduct of the affairs of the Association. One provides for the election by the council each year of three councillors at large, who shall serve for a term of three years. This will add to the council nine members

who have been chosen for their experience and interest in the Association, and who will give greater permanence and efficiency to this very important body.

With the idea of increasing the efficiency of sectional organizations, another amendment proposes that secretaries of sections be elected for a term of five years. Under the present method a secretary serves only long enough to learn his duties. This makes it impossible to obtain that continuity of experienced service which is necessary to develop the interests of the sections. There is no reason why such service is not as essential to a section as it is to the Association in the person of the permanent secretary. The same desire to increase the efficiency of the sectional organizations also prompted the proposed amendment providing that each section shall elect, annually, one fellow as a member of the sectional committee and that he shall serve five years.

Several reports of committees seem to call for comment. The committee on the policy of the Association made three recommendations which were adopted. One was that Section D (Mechanical Science and Engineering) be not discontinued, as had been suggested, since the recent entrance of a large body of engineers into the Association gives promise of a strong section. A second was the organization of the new Section (K) of Physiology and Experimental Medicine, which promises to be one of the strongest sections of the Association. A third was that all abstracts be restricted to 400 words, that they be published in SCIENCE and that the titles only shall appear in the published volumes of the *Proceedings*.

The report of the committee on the relationship of the Association and SCIENCE was full of interest, since it involved the first official statement of the results of this relationship. It was reported that the fees of new members have paid the expense of sending SCIENCE to all members. In this connection it may be well to state that according to the contract with The Macmillan Company the Association pays two dollars a year for each member to whom SCIENCE is mailed. These publishers certainly deserve honorable mention for their interest in promoting this movement, for it is estimated that SCIENCE will not be in the same financial condition as before the arrangement until the Association contains 4,000 members. There seems to be no question in the minds of members that the relationship with SCIENCE has been of very great advantage to the Association.

This leads to a mention of the noteworthy increase in the number of members during the last year, an increase which bears the strongest testimony to the efficiency of the permanent secretary and his immediate associates. For a few years the published lists of members showed a gradual decrease in number, until at the beginning of the last New York meeting there were 1,721 actual members. At the close of the Denver meeting, about a year later, the number of members is approximately 2,800, over 1,150 members having joined within the last year. Such a record is remarkable, but its chief importance lies in the fact that it shows what can be done with proper effort. Conservative members are now putting the number to be expected at 5,000,

while a prominent officer at the Denver meeting thought it should be 10,000. However this may be, the work of the past year has demonstrated clearly that an effort to increase membership, when wisely directed and persistently followed up, is sure to be successful.

The financial side of the Association is also becoming impressive. The report of the permanent secretary for 1900, which does not include the still larger income accruing thus far during 1901, shows receipts amounting to $12,321.60. Of this amount the sum of $1,300 was paid over to the treasurer for endowment, and a balance of $4,741.60 carried over to the next year. To meet the numerous expenses of so large an organization, and also to set aside more than $1,000 towards the permanent endowment for grants is an achievement for which the administration of the Association is to be congratulated. The same outcome will appear in the next report, for the Council has already set aside $1,000 from the receipts of 1901 for the permanent fund.

In regard to this permanent fund the treasurer's report showed that it now amounts to over $11,000, having doubled in seven years. This is gratifying because the income is used for grants to special committees to aid in the prosecution of research. The reports of these committees form an interesting part of the proceedings. With an organized effort for an increase in the number of members, and with the frequent communication among members secured by the relationship with this Journal, there seems to be no reason why the Association should not include in its membership all those who are engaged or interested in scientific work in this country and thus represent completely the organization of science in America.

The steady progress toward this end is demonstrated by the signal success of the Denver meeting. Heretofore the Association has been an organization expressing chiefly the scientific activities of the eastern states, no previous meeting having been held west of the immediate banks of the Mississippi river. Henceforth the Association is in fact as well as in name an organization expressing the scientific activities of the entire continent. This first Denver meeting, therefore, must be regarded as a noteworthy event in the history of American science.

PROCEEDINGS OF THE FIFTIETH ANNUAL MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The first general session of the Denver meeting was called to order in the auditorium of the High School Building at 10 o'clock in the morning of August 26 by the retiring president of the Association, Professor R. S. Woodward, of Columbia University, who introduced the president-elect, Professor Charles S. Minot, of Harvard University. President Minot introduced the Hon. J. B. Grant, president of the local committee, who, after some remarks welcoming the Association to Denver and to Colorado and the reading of a letter from the Governor of the State, introduced the Hon. R. R. Wright, Jr., Mayor of Denver; Mr. Charles F. Wilson, President of the Chamber of Commerce; General Irving Hale and Professor Aaron Gove, Superintendent of Schools, all of whom made addresses of welcome. To these addresses

President Minot replied in the words published below.

At the closing session the permanent secretary read the following report:

The fiftieth annual meeting of the A. A. A. S., which will be known in the future as the 'Denver Meeting,' or possibly, and let us hope, as the '*first* Denver Meeting,' has been a most successful one. There have been in attendance 306 members and associates, making the meeting in this regard rank as the 22d largest meeting. What may be termed the geographic distribution of the members in attendance has been interesting. From the Atlantic Coast region there have been 92, or nearly one-third, from the Pacific Coast 11, and from foreign countries 6, leaving two-thirds from the great interior of the country.

The distribution by States has been as follows:

Colorado heads the list with	79
New York	30
District of Columbia	28
Iowa	15
Missouri	14
Massachusetts	13
Penn'a., Illinois	12 ea.
Kansas	17
California	10
Nebraska	9
Indiana	8
Wisconsin	7
Minnesota, Ohio, Connecticut, N. Mexico	5 ea.
Wyoming, Canada, Michigan	4 ea.
Texas	3
West Virginia, Montana, Arizona	2 ea.
Georgia, North Dakota, South Dakota, Oregon, Nevada, Oklahoma, New Hampshire, Tennessee, New Jersey, North Carolina, Arkansas, Louisiana, England, Ireland	1 ea.

It must be borne in mind, however, that the number registered, 306, includes only the actual members and associates of the A. A. A. S., and that the great national affiliated societies of specific aim which have met with us have drawn many more scientific men and women to Denver within the past week, so that it has really been a scientific congress of much importance.

The papers which have been read before the Association proper and in joint sessions with the more closely affiliated societies have been numerous and of a high order. About 220 in all have been presented.

A number of important measures concerning the future of the Association have been considered. An amendment to the constitution providing for the representation in the Council of the affiliated societies seems one of the most important steps taken by the Association of recent years, while other amendments looking towards a more stable membership in the Council have been introduced and will be considered later.

About 50 new members have been elected during the meeting; and 186 members have been made fellows.

Denver and its vicinity have provided visiting points of great scientific interest, and the facts just stated, together with the great courtesy and warm-hearted hospitality of the citizens of Denver, have combined to make the meeting now coming to a close a memorable one in the annals of the old Association.

The members of the Council in attendance were:

Past President—R. S. Woodward, New York.

Vice-President of the Columbus Meeting—Marcus Benjamin, Washington.

Vice-Presidents of the New York Meeting—Wm. Trelease, St. Louis; Amos W. Butler, Indianapolis; Calvin M. Woodward, St. Louis.

Officers for the Denver Meeting—Charles Sedgwick Minot, Boston; James McMahon, Ithaca; D. B. Brace, Lincoln; John H. Long, Chicago; H. S. Jacoby, Ithaca; C. R. Van Hise, Madison; D. S. Jordan, Leland Stanford Jr. University; B. T. Galloway, Washington; J. Walter Fewkes, Washington; John Hyde, Washington; L. O. Howard, Washington; J. M. Coulter, Chicago; D. T. MacDougal, New York; G. A. Miller, Ithaca; John Zeleny,

Minneapolis; Wm. McPherson, Columbus; C. W. Comstock, Golden; H. B. Ward, Lincoln; Ernst Bessey, Washington; G. G. MacCurdy, New Haven; R. A. Pearson, Washington; R. S. Woodward, New York.

From the Association at Large—A fellow from each section: G. B. Halsted, Austin; E. L. Nichols, Ithaca; C. S. Palmer, Boulder; C. A. Waldo, Lafayette; T. C. Chamberlin, Chicago; F. M. Webster, Wooster; D. H. Campbell, Stanford; L. M. Underwood, New York; W J McGee, Washington; E. T. Peters, Washington; J. McK. Cattell, New York.

From the Affiliated Societies—American Chemical Society: F. W. Clarke, A. C. Hale. Geological Society of America: N. H. Winchell, H. L. Fairchild. Botanical Society of America: C. E. Bessey, B. D. Halsted. Society for the Promotion of Agricultural Science: W. J. Beal, Agricultural College.

The address of the retiring president was published in the last issue of this journal and the addresses of the vice-presidents and abstracts of the papers read before the sections are in course of publication. The more important business transacted by the Association was as follows:

An amendment to Article 18 of the constition, submitted at the New York meeting in 1900, was reported at general session from the council for favorable action and adopted. The amendment is as follows:

In Art. 18, after the words 'The Treasurer of the current meeting,' omit 'with the addition,' and after the words 'by ballot on the first day of its meeting' insert 'of one fellow elected by each affiliated society and one additional fellow from each affiliated society having more than twenty-five members who are fellows of the Association.'

The following amendment to Article 20 of the Constitution was also adopted:

Add to the end of Art. 20 the words, 'But if suitable preliminary arrangements cannot be made, the council may afterward change the time and place appointed by the general committee, if such change is believed advisable by two-thirds of the members present.'

The following amendments to the constitution were read before the council and at the general session and will be acted on at the next meeting:

In Article 9, after the words 'with the exception of the Permanent Secretory' omit 'and,' and after the words 'the Treasurer' insert 'and the Secretaries of the Sections; and after the words 'The term of office of the Permanent Secretary' omit 'and,' and after the words 'the Treasurer' insert 'and of the Secretaries of the Sections.'

In Article 18, after the words 'who are fellows of the Association,' insert 'and of nine fellows elected by the Council, three being annually elected for a term of three years.'

In Article 23, after the words 'of a Section there shall be' omit 'three members or fellows' and insert 'a member or fellow,' and after the words 'Vice-President and Secretary of the preceding meeting' insert 'and the members or fellows elected by ballot at the four preceding meetings.'

Reports of standing and special committees were presented and their recommendations adopted as follows:

COMMITTEE ON THE POLICY OF THE ASSOCIATION.

The Committee on the Policy of the Association presents the following recommendations to the council in regard to certain matters which have been referred to it for consideration:

1. The Committee recommends that owing to the great increase of engineers in the membership of the Association, it would be inexpedient to consider the question of the discontinuance of Section D.

2. The Committee recommends that the proceedings of the annual meetings, including the addresses of the Vice-Presidents, the reports of committees and officers, and abstracts of all papers, be published immediately in SCIENCE, and further that the addresses of the Vice-Presidents, titles of all papers and reports of officers and committees, the constitution and lists of officers, members and fellows, be published by the Permanent Secretary in a volume as soon thereafter as possible. The Committee further recommends that authors wishing to make alterations in abstracts of their papers shall do so before the close of the meeting and that abstracts shall not exceed 400 words in length. It further recommends that the Secretaries of Sections shall forward these abstracts with an account of the work of the meeting to the responsible editor of SCIENCE within a week after the close of the meeting.

3. The Committee recommends that Section K organize at the present meeting by the formation of a Sectional Committee and that papers submitted for

this Section at this meeting be referred in accordance with their character to Sections H or F.

[Signed.] CHARLES S. MINOT.
R. S. WOODWARD.
L. O. HOWARD.

COMMITTEE ON THE RELATIONS OF THE JOURNAL, SCIENCE, WITH THE ASSOCIATION.*

This committee is able to report that the arrangement by which SCIENCE has this year been sent to the members of the Association has been satisfactory in every respect. It has been generally approved and has apparently strengthened the Association and the organization of science in America. The membership of the Association has greatly increased, the fees of new members sufficing to pay the entire expense of sending SCIENCE to all members of the Association. We recommend that we be authorized to renew for the year 1902 the present contract with The Macmillan Company. We also recommend that the treasurer of the Association be added to this committee.

[Signed] SIMON NEWCOMB, *Chairman*,
R. S. WOODWARD,
L. O. HOWARD,
J. MCK. CATTELL, *Secretary*.

COMMITTEE ON CONVOCATION WEEK.

The plan of setting aside the week in which New Year's Day falls as a convocation week for the meetings of scientific and learned societies has met with almost universal approval on the part both of societies and of institutions of learning. At the instance of this committee, the Association of American Universities passed unanimously a resolution recommending the establishment of a convocation week, and the thirteen universities composing the Association have with one exception either left the week entirely free from academic exercises, or will give all officers leave of absence. We have now begun correspondence with about fifty additional universities, colleges and technical schools.

In view of the favorable reception of the plan for a convocation week we recommend:

1. That this Association and its affiliated societies meet in Washington in the week in which New Year's Day of 1903 falls, without, however, committing ourselves at present to the abandonment of summer meetings.

2. That the Council meet in Chicago during the Convocation Week of 1901–2, and that the Sectional Committees may organize meetings of their respective Sections, the expenses of each of which shall not exceed $25, to be paid from funds in the hands of the Permanent Secretary.

3. That this Committee be continued.

[Signed] CHARLES S. MINOT,
R. S. WOODWARD,
EDW. L. NICHOLS,
L. O. HOWARD,
J. MCK. CATTELL.

* Mr. G. K. Gilbert, the remaining member of this committee, was absent in the field and unable to sign this report, but it is known that he concurs in its recommendations.

NINETEENTH ANNUAL REPORT OF THE COMMITTEE ON INDEXING CHEMICAL LITERATURE.

The Committee on Indexing Chemical Literature, appointed by your body in 1882, respectfully presents its Nineteenth Annual Report, embracing the fourteen months from June 1, 1900, to August 1, 1901.

WORKS PUBLISHED.

A Select Bibliography of Chemistry, 1492–1897. By HENRY CARRINGTON BOLTON. Section VIII., Academic Dissertations. City of Washington, published by the Smithsonian Institution. 1901. 8vo. Pp. vi + 534.

This forms No. 1253 of the Smithsonian Miscellaneous Collections, Vol. XLI.

This Bibliography of Academic Dissertations is a second part of the work published in 1893, and with the 'First Supplement,' issued in 1899, completes (if the term can be applied to bibliography) the undertaking begun by Dr. Bolton in 1888. The three volumes comprise about 25,000 titles. The dissertations found in the libraries of the Smithsonian Institution and of the U. S. Geological Survey are indicated by appropriate initials. There is a full subject-index.

The completed manuscript of a 'Bibliography of the Analytical Chemistry of Manganese,' by Professor Henry P. Talbot and John W. Brown, has been carefully examined by your Committee, and they have recommended it for printing to the Smithsonian Institution to which it has been presented.

WORKS IN PROGRESS.

Mr. Frank R. Fraprie reports progress on his manuscript 'Index to the Literature of Cæsium, Rubidium and Lithium,' which is to be completed within a twelve-month.

Mr. G. A. Smith, of Cornell University, reports that his 'Index to the Literature of Selenium and Tellurium' will be completed by the close of the academic year.

Dr. M. D. Sohon is preparing for the press a 'Subject-Index to the Journal of the American Chemical Society.'

Dr. H. Carrington Bolton has in preparation another 'Supplement to the Select Bibliography of Chemistry,' intended to cover the period beginning with 1897, and to include omissions.

Dr. Alfred Tuckerman has revised and prepared for the press the continuation of his 'Index to the Literature of the Spectroscope'; the MS. has been presented to the Smithsonian Institution.

NOTES.

During the last twelve months there have been published the following bibliographical works on chemical subjects:

Bibliographia Lactaria. Bibliographie générale des travaux parus sur le lait et l'allaitement jusqu'en 1899. Paris, 1900. 600 pp. 8vo.

Bulletin de la Société chimique de Paris. Tables des années 1889 à 1898, dressées par Th. Schneider. Paris, 1900. Two Parts.

Zeitschrift für physikalische Chemie, Stöchiometrie, und Verwandschaftslehre. Namen und Sach-Register über Band I.–XXV., bearbeitet von T. Paul. Leipzig, 1900. 8vo.

And Professor A. K. Krupsky, of St. Petersburg, announces a 62-page 'Bibliography of Chemistry' in Russian, which your committee is as yet unable to describe more accurately.

H. Carrington Bolton (in Europe),
F. W. Clarke,
A. R. Leeds,
A. B. Prescott,
Alfred Tuckerman,
H. W. Wiley,
Committee.

COMMITTEE ON ANTHROPOMETRIC MEASUREMENTS.

At the New York meeting of the Association physical and mental measurements were made of about forty fellows of the Association, under the auspices of this committee. The number is not sufficient to permit of the publication of the results, but some points of interest were disclosed. We are anxious to continue these measurements, but cannot do so at Denver owing to the difficulty of transporting instruments and securing skilled assistance. We hope to overcome the former difficulty in future by the construction of instruments that can be packed in a dress-suit traveling case. The sum of $50 appropriated last year for the committee has been used in constructing instruments with this object in view, a balance and measuring rod having been made that can be readily transported. A traveling set of instruments of this character would be of value in anthropological expeditions.

The members of the committee resident in New York have continued anthropometric work, measuring the mental and physical traits of students of Columbia and Barnard Colleges, and of children in the schools. A thesis has been accepted for the degree of doctor of philosophy in Columbia University by Mr. Clark Wissler on 'The correlation of mental and physical traits.' This thesis, which has been published as a supplement to the *Psychological Review*, is the first full treatment by quantitative methods of the interrelation of mental and physical traits. Professor E. W. Thorndike has also at Columbia University carried on experiments on the correlation of mental ability, which will shortly be published.

For the completion of the traveling set of anthropometric instruments referred to, the committee asks a further grant of fifty dollars.

[Signed] J. McK. Cattell,
Franz Boas,
W J McGee.

REPORT OF THE COMMITTEE ON THE QUANTITATIVE STUDY OF VARIATION.

The grant of one hundred dollars to this Committee was used to help defray the expenses of Mr. C. C. Adams, incurred in collecting for study molluscs of the genus *Io*, found in the headwaters of the Tennessee River. A preliminary report has been made by Mr. Adams, and this was printed in the *Proceedings* of the Association for 1900. Mr. Adams submits at this time a second report covering the results of study on the material collected last summer, but prefers to postpone further publication until after his final expedition, which he is making this summer. The main results so far are that he has shown by the a'd of an elaborate series of measurements that the numerous species of *Io* run into each other in a very complete way, and that the differences between the shells are associated with their position up or down stream. Nevertheless there is in most streams a more or less marked discontinuity between the smooth, globular, up-stream shells and the spiny, elongated down-stream shells. The meaning of the discontinuity (which justifies, in a way, a division of the shells into two species) is still not perfectly clear. To test certain hypotheses in respect to this discontinuity, Mr. Adams has returned to the field this summer. This piece of work is, we believe, the largest and most thoroughgoing quantitative study of the variation of a species in nature that has yet been reported upon.

The committee requests the Council to grant it one

hundred dollars additional, to aid Mr. Adams in this his final summer's work on this topic.

The Committee is glad to report an increasing interest in the quantitative study of variation, and especially the establishment by Professors Pearson and Weldon of a new journal—*Biometrica*—devoted to the results of such study.

[Signed] FRANZ BOAS, *Chairman*,
CHARLES S. MINOT,
J. MCK. CATTELL,
C. H. EIGENMANN,
C. B. DAVENPORT, *Secretary*.

REPORT OF THE COMMITTEE ON THE RELATION OF PLANTS TO CLIMATE.

The investigations conducted under the guidance of the committee have been directed toward a study of the thermal relations of vegetation; an examination of the prevailing methods of meteorological observation in obtaining thermometric data has been made, and it is found that the data so obtained are incapable of direct application in the consideration of the seasonal development and distribution of plants.

As the result of two seasons of thermographic observation in the New York Botanical Garden and in the field in Montana and Idaho, a new method of calibration of the temperature exposures of plants has been formulated. This method is based upon a proposed hour degree-unit of temperature. Such unit of temperature may be defined as consisting in a departure of one degree Centigrade above or below zero for the period of one hour. The estimation of the number of such units affecting a plant in any given locality is obtained by the measurement of the areas enclosed by the thermographic curve above and below the zero line.

The number of such units of exposure to which the plants of two localities are subjected have already been estimated, and with incidental results will be presented to this Section at an early session. Thus, for instance, a meadow carpet in the New York Botanical Garden received 78,836 hour-degrees of heat during the year ending April 1, 1901, while the carpet in an adjacent hemlock forest received 68,596 hour-degrees of heat during the same period.

It is believed that the method of procedure outlined above will afford an exact method of dealing with the relation of plants to the temperatures of their environment, but it will be necessary to extend the observations over a number of years in the same locality in order to establish its usefulness and define incidental amendments.

The work involved in such observation entails constant observation by means of thermograph and much time in the calibration of thermographic curves.

Your committee asks a further grant of $50 for the furtherance of this work, it being proposed that the sum named should be expended in clerical and mechanical assistance. A further sum of $10 is asked for the repair of a thermograph wrecked in some recent field work in this connection, making a request for a total grant of $60.

The following items of expenditure are presented against the grant of $50 made by the Association to this committee at the meeting of 1900.

To freight charges on outfit from New York to Priest River, Idaho	$24.86
To hauling same to camp on Priest River, to Priest Lake and return	25.00
To making temporary instrument shelters (partial account)	.14
Total	$50.00

[Signed] WM. TRELEASE,
JOHN M. COULTER,
D. T. MACDOUGAL,
Committee.

REPORT OF THE COMMITTEE ON THE TEACHING OF ANTHROPOLOGY IN AMERICA.

To the Council of the A. A. A. S.: Your committee beg to report careful consideration of the matter committed to them. Two meetings have been held since the last report, and one of the committee (Dr. George Grant MacCurdy) has, by authority, prepared an account of anthropologic teaching in America during the past year to be presented as a paper before Section H. It is recommended that the committee be continued and empowered to issue circulars relating to the introduction of anthropology in American universities and colleges, *provided* such circulars have the approval of the Permanent Secretary and be issued without cost to the Association.

[Signed] W J MCGEE, *Chairman*,
GEORGE GRANT MACCURDY,
FRANK RUSSELL.

August 27, 1901.

COMMITTEE ON THE 'EMMONS HOUSE MEMORIAL.'

The American Association for the Advancement of Science was organized in 1847. It was the organic descendant and enlarged outgrowth from the Association of American Geologists and Naturalists. The latter body was created in 1842 by the incorporation of the Naturalists within the Association of American Geologists. The Association of American Geologists is therefore to be looked upon as the legitimate organic ancestor of the American Association for the Advancement of Science.

The circumstances which led up to the organization of the Association of American Geologists are as follows:

During the prosecution of the Geological Survey of the State of New York the need of the geologists for consultation and interchange of view with others engaged in official geologic work led to the suggestion of an organization of a body of American Geologists. It appears that Lieutenant W. W. Mather, one of the New York geologists, suggested the subject of such a meeting to the Board of Geologists in November, 1838. He wrote:

Would it not be well to suggest the propriety of a meeting of the geologists and other scientific men of our country at some central point next fall, say in New York or Philadelphia? There are many questions in our geology that will receive new light from friendly discussion and the combined observation of various individuals who have noted them in different parts of our country. Such a meeting has been suggested by Professor Hitchcock and to me it seems desirable. It would undoubtedly be an advantage not only to science, but to the several surveys that are now in progress and that may in future be organized. It would tend to make known our scientific men to each other personally, give them more confidence in each other and cause them to concentrate their observations on those questions that are of interest either in a scientific or economical point of view. More questions may be satisfactorily settled in a day by oral discussion in such a body than in a year by writing and publication. (Letter from W. W. Mather to the Geological Board of New York, dated November 9, 1838, and addressed to Professor Emmons.)

It appears herein that the suggestion of this meeting was originally made by President Edward Hitchcock, of Massachusetts, who was the first to receive the appointment as geologist of the First District of New York from Governor Marcy. President Hitchcock has said in regard to the suggestion made by Lieutenant Mather: "As to the credit he has here given me of having previously suggested the subject I can say only that I had been in the habit for several years of making this meeting of scientific men a sort of hobby in my correspondence with such." (Address of President Edward Hitchcock at the inauguration of Geological Hall, at Albany, August 27, 1856. Tenth annual report New York State Cabinet of Natural History, 1857, page 23.)

Lieutenant Mather's letter to the Board of Geologists was taken up for consideration at a meeting held November 20, 1838, at the house of Dr. Ebenezer Emmons, corner of High street and Hudson avenue, Albany. (See documents herewith appended being A, a statement dictated by Professor James Hall, August 24, 1896, and B, a statement dictated by Ebenezer Emmons, Jr., February, 1900.) The action taken by the geologists was one of unanimous approval of the proposition, and Lardner Vanuxem of the Third District was commissioned to open communication with other geologists, especially with President Hitchcock, with reference to carrying this project into effect.

The undertaking was not immediately successful and at a meeting held in the autumn of 1839 the purposes of the geological board were reiterated. This meeting was also held at Dr. Emmons' house, the four geologists and the paleontologist being present, and also Ebenezer Emmons, Jr., who still survives. As a result of the second undertaking on the part of the New York geologists a meeting was called in Philadelphia for April, 1840, where and when the organization of the Association of American Geologists was carried into effect. The following year the Association again met in Philadelphia, at which time the membership of the body was largely increased, and in 1842 the place of meeting was Boston and then, as already rehearsed, the name and the scope of the Association were, at the solicitation of the naturalists, both enlarged. President Hitchcock, addressing the New York public interested in the outcome of the work of their geologists, makes the following statement in the address already quoted:

It may be thought that the New York geologists in their invitation and the members of that first Philadelphia meeting had no thought of extending their Association beyond geologists; but Professor Mather's language just quoted speaks of 'a meeting of the geologists and other scientific men of our country,' thus showing what were his aspirations, and they were shared by all of us who had anything to do with that first meeting. But we knew that only a short time previous the American Academy of Arts and Sciences at Boston had directed a request to the American Philosophical Society as the oldest of the kind in the country, that it would invite the scientific men of the land to such a meeting as the one we are now enjoying; but the distinguished men of that Society decline through fear that the effort would prove a failure. Surely then it did not become us to announce any such intentions or expectations; yet we did talk of them and could not but hope that what might fail if attempted on a large scale at first might be accomplished step by step. *Had not the New York geologists issued that modest invitation and confined it at first to the State surveyors probably even yet we might have been without an Association for the Advancement of Science.* (President Hitchcock's address, ut. cit.)

The committee appointed by this Association to consider the matter of placing a memorial tablet upon the Emmons' house in Albany, N. Y., begs to submit the foregoing as evidence of the prenatal history of the American Association and to recommend that this house, the home of the late Ebenezer Emmons, a man of eminence in his profession, of untiring diligence and enduring patience, be permanently marked by a tablet setting forth the interest of that spot to the history of the Association. It is suggested that such tablet bear the following inscription:

In this house, the home of
Dr. EBENEZER EMMONS
the first formal efforts were made, in
1838 and 1839, toward the organization of the
ASSOCIATION OF AMERICAN GEOLOGISTS
the parent body of the
American Association for the Advancement of Science
by whose authority this tablet is erected
1901

The committee further reports that the cost of this tablet will constitute no claim upon the treasury of the Association, but will be borne individually by one of its members, Dr. T. Guilford Smith.

JOHN M. CLARKE,
C. H. HITCHCOCK,
J. MCK. CATTELL,
W J MCGEE.

A. Statement dictated to John M. Clarke, by Professor James Hall, August 24, 1896.

The organization of a body of American Geologists was proposed by the four geologists at Dr. Emmons' house at the corner of Hudson avenue and High street. It was during the fall of 1838. Vanuxem was asked to see or communicate with the Rogerses concerning it, but nothing came of it that year. The next year we reiterated our purpose as the intention was to get some means of comparing our results with those of other geologists in other States, especially in Pennsylvania. This meeting was held at Dr. Emmons' house, the four geologists being present and perhaps also Conrad. Ebenezer Emmons, Jr., was also there. We then decided to communicate again with the Rogerses and others for the end already suggested and to organize a Society of Geologists for this especial purpose. We wanted to compare our results with those of others and make up our nomenclature, and we had to do it soon, as we were required to publish. As a result of this unanimously expressed purpose a meeting was called for April, 1840, in Philadelphia. I was present then but not at the second Philadelphia meeting in 1841, as that year I was off in May and June with D. D. Owen on a flat boat sailing down the Ohio, sleeping on a box and collecting fossils all along from Louisville to New Harmony. As far as Rogers was concerned the meeting came to naught. He was not ready with his results and gave them only at the third meeting at Boston in 1842. It was here that the Naturalists proposed to join us and we agreed thereto, but the Boston meeting was called as the meeting of the Association of American Geologists and in the course of that meeting the name was changed to that of Association of American Geologists and Naturalists.

B. Statement dictated to John M. Clarke by Ebenezer Emmons, Jr., February, 1900.

I was present at the meeting of the four geologists at my father's house, in 1838. I was then about 16 years old, and had assisted my father in his field work and making drawings and sketches. Mr. Conrad, the paleontologist, was also present. I recollect that the board of geologists then authorized Mr. Vanuxem to open correspondence with others for the purpose of effecting an organization.

COMMITTEE ON GRANTS.

The following grants are recommended :

1. To Committee on Quantitative Study of Biological Variation, $100.

2. To Committee on Relation of Plants to Climate, $60.

3. To Committee on Anthropometric Measurements, $50.

4. To Committee on Determination of Atomic Weight of Thorium, $50.

[Signed] R. S. WOODWARD,
Chairman.

The report of the treasurer and the financial statement of the permanent secretary were as follows :

REPORT OF THE TREASURER.

In compliance with Article 15 of the Constitution, and by direction of the Council, I have the honor to submit the following report, showing receipts, disbursements, and disposition of funds of the Association for the year ending December 31, 1900.

Receipts have come into the keeping of the Treasurer from four sources, namely : First, from commutations of fees of life-members of the Association ; secondly, from excess of receipts over expenditures of the Permanent Secretary ; thirdly, from a contribution to the Association by Mrs. Phoebe Thorne, of New York City ; and fourthly, from interest on funds deposited in savings banks. The aggregate of these receipts is $1,805.07.

Disbursements made in accordance with the directions of the Council amount to $283.00.

The total amount of funds of the Association deposited in banks and subject to the order of the Treasurer, December 31, 1900, is $10,189.18.

The details of receipts, disbursements, and disposition of funds are shown in the following itemized statement.

Dated June 1, 1901.

THE TREASURER IN ACCOUNT WITH THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

1900.	Dr.	
Jan. 1,	to balance from last account.....	$ 8667.11
Oct. 20,	to amount received from L. O. Howard for 5 life-membership commutations.....	250.00

Oct. 20, to amount transferred from funds of L. O. Howard, Permanent Secretary		1000.00
Dec. 14, to contribution to the Association received from Mrs. Phoebe Thorne		250.00
Dec. 31, to interest on funds of the Association deposited in Savings banks, as follows:		
From Cambridge Savings Bank, Cambridge, Mass.	$35.70	
From Emigrant Industrial Savings Bank, New York, N. Y.	82.88	
From Institution for the Savings of Merchants' Clerks, New York, N. Y.	99.55	
From Metropolitan Savings Bank, New York, N. Y.	86.94	
		305.07
Total		$10472.18

1900. Cr.

Feb. 6, by cash paid Professor C. H. Eigenmann of Committee on study of blind vertebrates		$ 100.00
June 29, by cash paid Dr. D. T. MacDougal of Committee on study of the relations of plants to climate		33.00
Aug. 6, by cash paid Professor Chas. B. Davenport of Committee on quantitative study of biological variation		150.00
Dec. 31, by cash on deposit in banks as follows:		
In Cambridge Savings Bank, Cambridge, Mass	$ 1047.36	
In Emigrant Industrial Savings Bank, New York, N. Y.	3030.85	
In Institution for the Savings of Merchants' Clerks, New York, N. Y.	2818.97	
In Metropolitan Savings Bank, New York, N. Y.	2889.80	
In the Fifth Avenue Bank of New York, N. Y.	402.20	
		10,189.18
Total		$10,472.18

I have examined the foregoing account and certify that it is correctly cast and properly vouched.

EMORY MCCLINTOCK,
Auditor.

L. O. HOWARD, PERMANENT SECRETARY, IN ACCOUNT WITH THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, FROM JANUARY 1, 1900, TO DECEMBER 31, 1900.

Dr.

To balance from last account.		$4228.33
Admission fees previous to New York meeting	$15.00	
Admission fees New York meeting.	1275.00	
Assessments for 1901	76.00	
Assessments for 1900	4730.00	
Assessments for previous years	1244.00	
Associate fees	84.00	
Life membership fees	300.00	
Fellowship fees	134.00	7858.00
Publications and binding	194.80	
Interest.	30.61	
Miscellaneous receipts	9 86	235.27
		$12,321.60

Cr.

By publications.		
Vol. 48	$1131.45	
Binding	94.55	
Separates of addresses	74.01	
Columbus pamphlet	109.85	
Illustrations, Vols. 48 and 49.	58.01	
Index, Vols. 48 and 49.	24.25	1492.12
By expenses New York meeting.		
Daily program	600.00	
Preliminary announcements, sectional programs, etc.	101.78	
Messengers, typewriters, placards, blanks, badges, etc.	94.16	
Accounts of Secretaries of sections, and Gen. Sec.	322.05	
General expenses	107.11	1225.10
By general office expenses.		
Circulars, tickets, blank forms, letter heads, etc	155.75	
Postage.	350.93	
Express	318.41	
Extra clerical help, typewriting, etc	26.37	
Telegrams, check book and miscellaneous small expenses.	29.65	881.11
By salaries.		
Permanent Secretary	1250.00	
Assistant Secretary	720.00	1970.00
By spreading information in order to increase membership (by order of Council).		
Postage.	105.90	
Circulars and blank forms.	82.23	

Typewriting, addressing envelopes, etc.....	110.50	298.63
By miscellaneous expenses.		
Storage on back volumes.....	154.50	
Moving same to N. Y. for free storage.....	204.15	
Moving office effects, North Andover to Washington ...	27.73	
Grant to committee (order of council).....	17.00	
Overpaid dues returned.....	9.50	
Cash paid Treasurer.....	1300.00	1712.88
By balance to new account.....		4741.76
		$12321.60

I hereby certify that I have examined this account and that it is correctly cast and properly vouched for, and that the balance was on deposit in Washington banks as follows: Citizens National (as per statement Jan. 8, 1901), $3229.62; National Safe Deposit (incl. interest credited Jan. 1, 1901), $519.43; American Security and Trust (incl. interest credited Jan. 7, 1901), $1034.58; in all, $4783.63.

G. K. GILBERT, *Auditor.*

The following is a list of the officers elected to serve at the next meeting, including also the permanent secretary and treasurer previously elected for a term of five years:

President—Asaph Hall, U. S. N., retired.

Permanent Secretary—L. O. Howard, chief entomologist, Agricultural Department, Washington.

Assistant Permanent Secretary—Richard Clifton, Agricultural Department, Washington.

General Secretary—D. T. MacDougal, director of the laboratories, New York Botanical Gardens.

Secretary of Council—Professor H. B. Ward, of the University of Nebraska.

Treasurer—Professor R. S. Woodward, Columbia University.

OFFICERS OF SECTIONS.

A (Mathematics and Astronomy)—*Vice-president*, G. W. Hough, Northwestern University; *secretary*, E. S. Crawley, University of Pennsylvania.

B (Physics)—*Vice-president*, W. S. Franklin, Lehigh University; *secretary*, E. F. Nichols, Ohio State University.

C (Chemistry)—*Vice-president*, H. A. Weber, Ohio State University; *secretary*, F. C. Phillips, Western University.

D (Mechanical Science and Engineering)—*Vice-president*, J. J. Flather, University of Minnesota; *secretary*, C. A. Waldo, Purdue University.

E. (Geology and Geography)—*Vice-president*, O. A. Derby, San Paulo, Brazil; *secretary*, F. P. Gulliver, Southboro, Mass.

F (Zoology)—*Vice-president*, C. C. Nutting, Iowa State University; *secretary*, C. W. Stiles, Department of Agriculture, Washington.

G (Botany)—*Vice-president*, D. H. Campbell, Leland Stanford University; *secretary*, H. Von Schrenk, Shaw School of Botany, St. Louis.

H (Anthropology)—Stewart Culin, University of Pennsylvania; *secretary*, H. I. Smith, American Museum of Natural History, New York.

I (Social and Economic Science)—Carroll D. Wright, commissioner of labor, Washington; *secretary*, W. F. Wilcox, Cornell University.

K (Experimental Medicine and Physiology)—*Vice-president*, Dr. W. H. Welch, Johns Hopkins University; *secretary*, Dr. F. S. Lee, Columbia University.

The recommendation of the general committee of last year that the Association meet at Pittsburg in the summer of 1902, was supplemented by Dr. W. J. Holland, Director of the Carnegie Institute, and it was decided to meet at Pittsburg from June 28 to July 3, inclusive, 1902.

The general committee recommended also that a meeting be held in Washington, D. C., during 'Convocation Week,' or the week in which the first of January falls, in 1903.

Professor Wm. Trelease and C. M. Woodward presented an invitation to the Association to meet in St. Louis during the time of the Louisiana Purchase Exposition in 1903. This invitation was referred, without formal recommendation, to the general committee of 1902.

JOHN M. COULTER,
General Secretary.

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*REMARKS OF PRESIDENT MINOT.**

I WAS impressed on my way here with the somewhat unexpected arrangements I found for securing my services as a visitor at Denver. We found it easy to get here because we paid for a night's journey upon the road and owing to the delay of the train we got two nights' journey instead of one, showing how attractive it is here and how liberally one is treated coming to Denver. But when I went to your ticket office to in-

* Made at the opening general session, and reported stenographically.

quire about going away I found we had to pay the price of two nights in order to pass one when leaving your city. So there seems to be every inducement to prolong our stay. I could not but think, as I read in the newspaper that this Association had fallen upon Denver, of an anecdote related to me a few days ago in the Yellowstone, when I was told a German visitor had been there and seen the geysers, and afterwards had gone to Niagara. When asked how he liked it, he said, "Oh, dat is very fine, but you shall see the geysers, they fall oop." That is the way we have 'fallen upon' Denver. We are all wonderfully impressed by the extraordinary endowments of nature in this state. It is almost incredible to a visitor coming here for the first time that any tract of land should be so richly provided with all the raw resources which man needs for the construction of civilization. We, like you, are laboring in this process of building up civilization. As you have been working in your state, so we work in every territory of nature seeking to bring forth her hidden treasures and render them available for the service of mankind and for establishing a higher life in humanity than has yet been. It is not so in the east with us at home. There civilization has been going on longer. The resources which nature provides are known. The work of civilization proceeds there in established channels, and I felt at once in coming here that the newness and creative character of your work in Colorado made a sympathetic atmosphere for us who are striving to create what is new and get from nature her unused treasures which we can employ hereafter. Everything therefore speaks of sympathy and understanding between the practical life of Colorado and the scientific life of this Association. And we are, too, nearly co-temporaries. The Association was before Denver was, but not by many years. We have, as it were, grown up together and have lived through the same period of our country's history. Therein, too, lies the power of appreciation—mutual, I believe—between you and us who are here playing a double rôle of both guests and, in our meetings, of your hosts—for hosts we would gladly be, inviting you to our meetings, for we are a kind of intellectual Salvation Army. We do not profess to do much for the saving of souls as our direct work, though we believe that all good work tends to that end, but we do believe that we can do a great deal to save brains, they being the only things in nature which in being used are best saved and made better. So if we stimulate you to use your brains more we shall have done some service, we shall have done something to save your intellectual life, to broaden it and make character. If as a biologist I survey the realm of nature and seek to make out what is the distinguishing characteristic of man, I have to recognize that it is the value of the individual which distinguishes the human species from every other living species in the world. Man alone is able to profit by the superiority of the individual members of his species. Animals may learn a little from one another. Man alone can learn much. It is owing to this peculiarity in nature of the human species that science exists, that civilization exists, and I believe the recognition of that fact should have a profound influence upon all our political and social questions whenever we have in mind the promotion of human welfare; because, it being a true fact in nature that the average civilization of a community is not correspondent to the average intellectual and moral calibre of its members, but very nearly to the intellectual and moral calibre of its best members, that fact imposes upon us a special duty, that of promoting the development and the education of the best members in the community. And if I were asked to say what in the west seemed to me

the very best thing you had to show, I should say without a moment's hesitation it is the high school buildings here and the high school buildings we have seen in the other cities as we have passed along—emblems, as they are, of the educational system which in the very establishment of its high schools recognizes the fact that there are superior individuals who are worthy a better education than is offered by primary and grammar schools below.

But it does not do to stop there. And I am glad to see that the State of Colorado has started already the development of a university which by its prosperity shows the earnestness with which it has been founded, the devotion which has been spent upon fostering it and which stands as one of the highest marks to the credit of the State. I believe that the very best that we could do for you would be to contribute something to the public recognition of the value of the State University. It seems to me that no citizen of Colorado who has the highest ideal for the future of the state can feel that the state has done its full duty until it has developed its university, not only as it has begun, but farther in the same direction, until it shall have become one of the great universities of the country—I would even say one of the great universities of the world. It is not enough for you to work here for the development of your material resources. It is not enough for you to apply science. We who are carrying on our investigations supply the power, we generate the steam pressure, and the practical man—if I may be pardoned for the innuendo—is the crank which transmits the power to a practical purpose. Unless a state is doing its quota towards the increase of knowledge, it is fulfilling only a part of its duty. If, therefore, our coming here can have such an influence upon any of you as to increase the belief in the value of your university and to spread that belief among you, making it deeper rooted in the innermost convictions of your great community that the university is the greatest thing in the state, we shall have done a service to you which will show we are grateful for all the magnificent hospitality which has been proffered us, for the perfection of the arrangements made here for our comfort, and that we appreciate your words of welcome, those which have come to us from the Governor, from the Mayor of the city, from the representatives of the business interests of your community and of your educational system. All this we take to heart and we beg to thank you for it with all the sincerity with which we appreciate it. And in return we would offer you this thought which is the inspiration of the professor—that the country is governed by universities, because what is done in the country is done by the men who think, who come out into the world with thoughts which were never there before; and the men who do that, with very rare exceptions, are men who have had their minds severely disciplined by university training. If you look back through the history of the United States and recall men who as statesmen, as inventors, as authors, were creators of any kind of new intellectual product, you will find that there is but a trifling number among those great men who have not come from the universities. And, therefore, it is true as a historical fact that this country is governed by the universities, and there is not a complete government in any state, in the opinion of the members of this Association—I am sure in the opinion of all of them—until there is a great, well-equipped, richly endowed and largely attended university. It is therefore to me the greatest pleasure to say that Colorado has begun with this ambition, and I hope with all my heart that you will carry it through to a fulfilment corresponding to the extraordi-

nary fulfilment which you have achieved in all the other work you have undertaken in the development of your state, and with that wish and with thanks on behalf of our Association I would close with an invitation to you all to attend our meetings; and I would express particularly the hope that all of you who are interested in broad discussions and deep-thought views of scientific problems will take advantage of the opportunity to hear the address of our retiring President, which will be the central and most interesting event of our proceedings. With thanks, therefore, for your courtesy and kindness, and expression of pleasure on behalf of all the members of the Association who are here, I will now close my reply to the hospitable welcomes which have been made us.

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*SOME POINTS IN THE EARLY HISTORY AND PRESENT CONDITION OF THE TEACHING OF CHEMISTRY IN THE MEDICAL SCHOOLS OF THE UNITED STATES.**

In the scientific awakening of the latter part of the eighteenth century medicine was not the last of the great departments of human learning to take on new vigor. As in earlier years it drew largely from alchemical philosophy for the enrichment of its materia medica, and for the justification of a crude therapy, so now the great teachers of physic stood ready to accept the rapidly developing facts and generalizations of the new chemistry, and to apply them in the noble task of elevating a dogmatic empiricism to the plane of a scientific system. From the time of Paracelsus, alchemy, and its offspring, chemistry, had been but the handmaids of medicine, and much of the skill of the workers in these fields was devoted to the preparation of remedies for various diseases. But, from the labors of Priestley, Scheele, Watt, Cavendish and Lavoisier, the relations were reversed, and the chemists and the apothecaries, the cooks in the kitchen of the doctor, seemed ready to usurp the proud positions of their former masters. The nature of oxidation and the phenomena of respiration changes explained, it was clear that medicine must now depend largely on the development of chemistry for its rational groundwork.

After the downfall of the old iatro-chemistry with its empiricism and evident hollowness, our science had fallen into disrepute in the great European centers of medical learning, and physicians were somewhat slow in taking up the new ideas. But, the way once opened, the development spread rapidly, almost too rapidly in fact, because of the danger always attending hasty generalization.

The educational influences at work in the American colonies in those days were almost wholly English, and the earliest medical schools established here were modeled after those of Great Britain. We find, therefore, that in each one of the medical schools founded in the pioneer days of attempt in professional education a chair of chemistry was provided for as furnishing a necessary part of the medical student's education. Indeed, the first chair of chemistry of any kind to be filled in this country was that in the medical school of the University of Pennsylvania, and the occupant was Dr. Benjamin Rush, a man justly famous in the early history of American medicine, but not known on account of any chemical writings. This was in 1769, and the position was held by him until 1789. In the autumn of that year Dr. Rush was transferred to another department, and Dr. James Hutchinson was elected to fill the place. The latter died in 1793, and Dr. John Carson was appointed his successor in January, 1794, but died

* Address of the Vice-president and Chairman of Section C, Chemistry, at the Denver meeting of the American Association for the Advancement of Science.

without serving. In this year Priestley came to America, and lived for a short time in Philadelphia. He was offered the chair, but after some delay declined it on account of poor health and the desire to lead a quiet life in a rural country, which he found later on the banks of the Susquehanna at Northumberland.

In July, 1795, the place was again filled by Dr. James Woodhouse, who served until 1809. His successor was John Redman Coxe, who was among the earliest writers on chemistry in this country, since he published in 1811 a small work entitled, 'Observations on Combustion and Acidification; with a Theory of these Processes founded on the Conjunction of the Phlogistic and Antiphlogistic Doctrines.' Dr. Coxe was followed by Robert Hare, who was a man of great ability and a credit to the new country. Hare made numerous discoveries himself, some of them of permanent importance, and besides rendered a service to students by bringing out an American edition of Henry's chemistry. Some years later he published a text-book on chemistry himself for the use of the medical students of the University of Pennsylvania. As Hare's position was unquestionably the most important one of the kind in the country, it may be well to give a few moments' attention to his work as typical of the best of the period.

Hare began his career at a time which, from one point of view, might be considered as very unfavorable for the development of chemistry in America. The early aspirations of the founders of the Philadelphia College had failed of realization because, as must be recognized, they were beyond the practical sympathies or comprehension of the masses. The requirements for the attainment of the degree of Doctor of Physic were relatively, and in some respects, perhaps, absolutely, far in advance of those of the present time, and this the colonies were not ready for. Then came the Revolution, followed by a long period of political discussion and rapid internal development, and finally another bloody war. This left the country poor and yet farther behind again in the sphere of intellectual development. The great European wars of the same period had not hindered scientific discovery or cultivation in France and England, at least. Through these years of turmoil, the beginning which had been made in the few American centers where chemistry was taught had come almost to a standstill, and Hare entered upon what might appear a field of little promise. But the man was an independent thinker, and the example of Berthollet, Dalton, Davy, Berzelius, Gay Lussac, Humboldt and others was not lost on him. He began his work as a private student and partly in conjunction with the elder Silliman, who came to him before beginning at Yale, and while yet a young man attracted considerable attention by the discovery of the oxy-hydrogen blowpipe, a description of which was published in 1802. Later he constructed a new form of galvanic cell with very large plates which was known as the calorimotor or deflagrator, and this gave him no small reputation abroad as well as at home.

Hare's theoretical explanations of phenomena observed were not always correct, and in some of the many polemics in which he took part he certainly defended the weaker side of the argument, but in looking through his writings one cannot but be impressed with the ingenuity he displayed in contriving experiments to illustrate simple principles.

One of the best known works of chemistry of this time was that of Dr. Henry, of Manchester. The last American edition of this was brought out by Hare, and was used in his own classes and elsewhere in the United States. Later he brought out a book of his own with the title, 'A Com-

pendium of the Course of Chemical Instruction in the Medical Department of the University of Pennsylvania, by Robert Hare, M.D. For the use of his Pupils.' There were four editions of this. The last appeared in 1840–43. In the preface of this book I find this curious passage, which reads as if it might have been written yesterday: "A chemical class in a medical school usually consists of individuals who differ widely with respect to their taste for chemistry, and in opinion as to the extent to which it may be practicable or expedient for them to learn it," etc.

With this idea of the difficulty of the subject and of the slight inclination on the part of many medical students to master it, Hare prepared a work in simple style containing an unusually large number of experimental illustrations and practical suggestions for the pupil. How successful he was with students it is now impossible to say, but that he impressed himself as a powerful teacher I have been assured by one who remembered him in his later years. He remained with the University until 1847, and died in 1858. He continued actively engaged in scientific work to the time of his death, and contributed numerous articles to the journals. No less than 150 were published in *Silliman's Journal*. That his work was respected abroad as well as at home is shown by the fact that he maintained an active correspondence with Faraday, Liebig and other great men of the day, and that we find frequent reference to his articles in contemporary writers and in the earlier volumes of the *Jahresbericht*.

While Hare was prominent in Philadelphia, Silliman, Gorham and Mitchill were developing the departments of medical chemistry in Yale, Harvard Medical School and Columbia. In the last two medical schools chemistry was taught almost as early as in Philadelphia, but apparently with less vigor, while at Yale it was taken up later.

In 1802 Benjamin Silliman, then a young man, was appointed to the chair of chemistry at Yale, and before beginning work he visited other schools in search of ideas. Prior to 1800 there seems to have been but a single chair of chemistry in the country outside of the medical schools, and this was held by Dr. John MacLean at Princeton. Silliman went there first and profited by what he saw. Later he went to Philadelphia, where he met Woodhouse, Priestley, Hare and others. Hare seems to have made the greatest impression on him, and they worked often together. In the next few years Silliman visited Europe, and on his return to New Haven aroused much enthusiasm among the scientific and medical men. It was largely through his influence that a medical school was established at Yale, and of this he became the first professor of chemistry and pharmacy. The Medical Institution of Yale College, as it was called, was chartered October, 1810, and four professorships were provided for, 'the first of chemistry and pharmacy; the second of the theory and practice of medicine; the third of anatomy, surgery and midwifery; the fourth of materia medica and botany.' It will be noticed that the chair of chemistry is here mentioned first, doubtless a tribute to Silliman's reputation and influence. He continued to give instruction to medical as well as to general students for many years, and through his writings and the journal he established he became the best known scientific man of the day in America. Silliman's interests, however, were in lines remote from medicine, and he therefore failed to exert here the influence enjoyed by his friend Hare.

The Medical School of Harvard College was established in 1782, and in 1783 Dr. Aaron Dexter was made the professor of chemistry and materia medica, his time being devoted to teaching general and medical chemistry. It does not appear that he

published any researches or did much to advance his science, but he was a man of personal popularity, and it was through his influence that the Erving professorship was founded by Major Erving, who was one of his patients. Dexter served until 1816 and was followed by Dr. John Gorham, a man of marked ability, who published a number of researches showing skill and understanding, and who must be given credit for bringing out the first original book on chemistry published in this country. The two large volumes compare very favorably with the work of his European contemporaries. Gorham, who was recognized as a power in the medical school, now moved to Boston, and his reputation was of the first order among his colleagues. He laid the foundation for the excellence in a department which has steadily grown in importance to the present time. Gorham was followed by Dr. John White Webster in 1827, an alumnus of Harvard, and a man of promise who increased the reputation of the university, and especially of the medical school by his original scientific contributions and by editing several well-known foreign works. His text-book on chemistry on the plan of the work of Brandes has considerable merit. The fate of Webster in connection with the Webster-Parkman tragedy of 1850 is probably known to all here.

In New York the old King's College had become Columbia College, and in 1792 established its first professorship of chemistry. This was in the medical school, and Dr. Samuel Lathan Mitchill was given the chair. It was this man who introduced the Lavoisier nomenclature in the United States, and in consequence was engaged in many controversies with Priestley. In 1798 he established the *New York Medical Repository*, and managed it for many years. It was the first medical journal started in this country, and exerted no little influence, receiving contributions in general science as well as in medicine.

In 1807 a charter was granted to the College of Physicians and Surgeons in New York, and in 1811 Dr. William James Macnevin was made professor of chemistry. He was a man of marked ability, having taken the medical degree at the age of twenty in Vienna. Several scientific contributions from his pen are found in the journals of the time, and among other things he wrote 'An Exposition of the Atomic Theory,' which attracted much attention.

It will not be necessary to trace the history of chemical teaching in the other early medical institutions, as practically nothing of consequence is found recorded. The schools referred to were far in advance of those established elsewhere, and have in a large measure maintained their superiority to the present time.

For many years chemistry was taught to medical students by lectures only, and the introduction of even simple laboratory work is of comparatively recent date. In Harvard Medical School, for example, laboratory courses were not given until 1872.

It would be a discouraging task to try to follow the development of chemical teaching in medical colleges down to the present time. Few institutions were blessed with such men as Hare, Silliman or Gorham, who exerted an influence of priceless value on medical men now rapidly passing away. Owing to peculiar causes which I need not try to explain here, medical schools multiplied very rapidly in the United States, and in most of them the chair of chemistry was considered in the light of a necessary evil. As a matter of form chemistry had to be taught, but how it was taught and how it was followed by the students, were questions of wholly secondary importance. It has long been the custom in the medical schools of this country to divide the chairs into the theoret-

ical and the practical. The American boy has been taught to hold practical things in the highest esteem, and chemistry was not practical. Professors and students alike felt it, and it is hard to tell who was the most to blame for the warped and stunted conception of chemistry held even at the present time by the great majority of medical men of this country. It is likely that much of the fault lay in the weak and wholly unsatisfactory manner in which chemistry was presented for fifty years in most of our medical schools. The professor of chemistry was usually a physician who, as a rule, was not considered sufficiently strong to fill the chair of practice, obstetrics or surgery, but who might teach acceptably the less important branch of chemistry. For the convenience of such teachers a peculiar system of chemistry called 'medical chemistry' was developed, and in some places persists to the present time. The idea that a man trained outside of a medical school could teach the kind of chemistry which medical students really needed was of slow development in the United States, and in some quarters fails yet of recognition. But for part of the trouble we must go farther back. While students in general courses were taught the elements of the sciences, languages and mathematics by recitations and quizzes, medical students, with far weaker preliminary training, were supposed to be able to absorb the essential facts of a great department of human knowledge from lectures alone. The lecture system is responsible for much of the superficiality in the old-fashioned medical schools, and no real progress was made until it began to be recognized that a medical student must be taught as other students are. With the gradual dawn of this notion it became finally possible to introduce into medical colleges rational chemical instruction, and the laughable farce of presenting the so-called medical chemistry to students ignorant of general chemistry will in time be a thing of the past.

This medical chemistry to which I call your attention was often a curious combination of the good and the absurd. Admitting that the student should know something about the chemistry of the blood, the bile and the urine, something about the nature of food stuffs and the processes of digestion, it was thought sufficient to present all these matters to him in condensed, so-called 'practical' form, and without first requiring a solid preliminary training in general and inorganic chemistry. It was considered the correct thing to memorize a lot of definitions, and to learn to recite in parrot fashion a number of empirical organic formulas. It must be admitted, however, that the fault was not confined to medical schools alone.

Chemistry in general may be studied from two standpoints. First, as in the college of liberal arts, as a fundamental discipline, regardless of the possible application which one may make of it. On the other hand, it may be pursued as a necessary preliminary to the understanding of something else, and in this case its mastery becomes all-important. One would naturally suppose that in the latter case the science would be much more thoroughly cultivated than in the former, but this is not always true. The discrepancy is perhaps most glaringly apparent in the chemical work of the medical schools. It cannot be expected of course that the chemistry offered to the medical student of to-day should be, as in the time of Hare, Gorham and the elder Silliman, more complete than that given to other students; this would be impossible and wholly unnecessary, as chemistry is now a great specialty with numerous departments branching in all directions and a literature as voluminous as that of scientific medicine itself. But this much should be reasonably expected, that

the medical student's elementary chemistry should be at least as thorough as that of the student in liberal arts. It seems absurd to think that a man preparing, possibly, for law or theology or commerce, or studying without thought of any specialty should be made to acquire a fuller, more accurate knowledge of chemistry than that expected of the future medical man. If chemistry is of value at all, it certainly is to the doctor, rather than to the preacher, lawyer or man of business, yet in the United States in the last fifty years, the doctor's training in chemistry has been, on the average, less exacting than that of the other classes mentioned. If any one is disposed to doubt what I say let him compare the numerous 'Essentials of chemistry for the medical student' with the text-books used in other schools in the same science. It is anomalous that the doctor's chemistry should be usually the weakest of all.

But we are gradually emerging from this discouraging situation, and the improved condition is mainly due to the recognition of this fundamental truth, that there is not one kind of elementary chemistry for the doctor, another for the lawyer and a third for the preacher. There is no royal road to the acquisition of the necessary groundwork, and the medical man's elements must be learned through the same kind of patient effort that is required of other men. In the best of the medical schools of the country to-day chemistry is no longer taught by practitioners of medicine, and an honest effort is being made to present the subject as it is presented to beginners in schools of science. Such a course of laboratory and recitation work should require at least ten hours each week through a year of eight months to cover the work preliminary to the proper study of medical or physiological chemistry in the second year.

This leads me to explain what I consider the minimum work in preparatory chemistry for the medical student, and the character of this work. First, he should have the usual lecture or recitation course of about seventy-five lessons in general and inorganic chemistry, with especial attention paid to the theoretical groundwork. A discussion of the common inorganic salts is of less importance. This work should be followed or accompanied by a laboratory course in experiments, including the preparation of a few pure substances. In most of our schools the value of preparation work has not been sufficiently recognized, the time which might be spent there going usually to qualitative analysis which I believe is correspondingly overestimated. Inorganic qualitative analysis for most students becomes a mechanical routine in which the important element of discipline is wanting. As in the future work of the physician this branch of analysis finds little or no application, I believe the time given to it in preparatory medical work may be greatly curtailed. During the past twenty years, in which I have given instruction to medical students, I have had abundant opportunity to observe this fact, that men who have entered with training in experiments and preparations and no qualitative analysis make as a rule far better progress than do those whose laboratory work has been wholly analytical. Many of our colleges still begin their laboratory work with qualitative analysis, which, perhaps, is a relic of concession to the old utilitarian notion, and I am convinced that for the average student the time so spent is largely wasted. On the other hand, volumetric analysis may be made a medium of imparting important knowledge in fundamental principles, and I believe it should find early presentation in all our courses, general as well as medical, that it should precede rather than follow gravimetric analysis as is customary. In the case of the medical student the im-

portance of volumetric analysis is twofold. Not only is it a valuable discipline in itself, and discipline is above all what is needed in preparatory medical training, but it also becomes an instrument of practical application in the physician's subsequent work. In his practical routine labor of a clinical nature the physician is constantly called upon to make a few qualitative tests which are soon learned and easily followed. He should be in a position to make a wider range of quantitative tests, and these, almost of necessity, must be volumetric. The preparatory medical course should provide this skill, not merely in a mechanical way, but by giving a thoroughly rigorous drill in the few fundamental principles of volumetric analysis. The statement I have just made may provoke a smile, inasmuch as I may appear to be giving advice on a matter which everyone well understands, and suggesting a course which is commonly already everywhere in practice. But it has been my experience that the matter is by no means as simple as it looks. The apparently elementary relations in volumetric analysis are not fully grasped by the general class of students, even by those who devote far more time to laboratory chemistry than is the case with the medical students of our best schools. In support of this I must state that in the last fifteen or twenty years it has been my fortune to instruct hundreds of medical students who had already had laboratory training in chemistry in excellent schools, well-known state universities among the number. While these men have often brought sufficient knowledge of facts, they have as often been very deficient in acquaintance with principles, leaving them unable to deal with cases presenting slight variation in conditions from those of their former practice. Our methods of instruction fail as long as they allow the memorization of facts and isolated methods to take the place of a study of principles. I am often asked what the value of this or that inorganic volumetric process is to the medical student, and my answer is that it illustrates a principle not readily learned in any other way. And it is safe to say that almost any one of these illustrative methods may find practical application in the physician's own work. The titration of weak acids, for example, is now a common operation in connection with the examination of stomach contents, and the permanganate titration has come into common use in the most accurate process we have for the estimation of uric acid.

I trust that I have made myself understood in insisting that the groundwork of the medical man's education in chemistry should be in the group of topics usually classed as inorganic, and this largely because of the superior advantages of this branch of the science in the presentation of general principles. I feel, therefore, like combating strongly the notion often expressed by medical men that students in medicine should not be required to 'waste' time on inorganic chemistry.

A few words as to the place of general organic chemistry in the preparatory or first year course. The subject is one of such large proportions that at best only an outline can be attempted in the first year course, but that much should at least be given. Leaving the major portion of the discussion of the sugars and other carbohydrates, the fats and the products of fermentation to be taken up with physiological chemistry proper in the second year, I believe that a fairly satisfactory outline may be given in about thirty lessons in the first year course. Remember, I am not writing this for men who expect to be chemists, and I am describing the minimum requirement which I should insist upon. In a short course of the kind it will be necessary to omit many things often supposed to be

of prime importance in the so-called medical chemistry. I have seen text-books for medical students abounding in descriptions of processes for making many of the modern synthetic remedies along with discussions of the supposed structural formulas of these compounds. This knowledge is interesting, but it is far from essential, as few principles are cleared up by it which cannot be presented to the student in more tangible form. It should be further remembered that there is a distinction between chemistry and materia medica, and much matter presented to students as chemistry properly belongs in the other field. The time spent in memorizing the empirical formulas of the medicinal alkaloids and of the host of antipyretics, hypnotics, etc., might better be given to a study of principles.. Of course I would not be understood as urging that the medical student need not be taught the constitution of any organic compounds, but I merely claim that there is a limit to the amount of this knowledge which may be considered practical or profitable.

I have spoken of the work just described as first year medical work, as it may be taken before entering the medical school or in the first year of the course in medicine. The time is not far distant when all the courses I have described, and doubtless more, will be required for admission to the best schools. At present Harvard Medical School has such a requirement, and other institutions have it under consideration. Many colleges of liberal arts and technical schools offer now a so-called preparatory medical year in which chemistry is the principal topic. Certificates for such a year's work admit to the second year of many of the medical schools of the country. In my experience the plan is not yet a satisfactory one, as the chemistry courses taken under these conditions seems to be lacking in rigor and discipline. They seem to be followed under the notion that medical school chemistry is so completely lacking in thoroughness that anything may be pursued as its equivalent.

In the last few years students have begun to present high school certificates for chemistry work as equivalent to that in the first year of the medical school. The courses taken in the high school at first sight may appear to be more than equivalent to those in the beginning year of the medical course, but a careful consideration of many cases has convinced me that in general it would be very unwise to grant credit in the medical school for work apparently done in the high school in chemistry. At the age at which boys and girls now do their chemistry work in most of the high schools it is quite impossible that the subject can be properly mastered. In my opinion the superficial courses now given in science in hundreds, perhaps thousands, of high schools throughout the country constitute one of the weakest spots in our system of public education. The attempt is often made to cram more chemistry into the high school boy at sixteen than many of our smaller colleges find possible at twenty. In much of this work the glorification of the teacher, not the true edification of the pupil, seems to be the prime object in mind, and the result is deplorable. With these facts in view, I always feel justified in rejecting the application of the student for advanced standing on account of high school work in chemistry. I am therefore inclined to the opinion that under existing conditions the medical student's work in general and inorganic chemistry can be best done either as a part of a thorough and required college course, or after entering the medical school itself, and that wherever done it should be characterized by a much more systematic and painstaking drill in fundamental principles than seems now to be the case in many institutions.

It is not my intention to enter upon a

discussion of what the course in physiological chemistry should be in medical schools. At present this often consists of a laboratory course in urine analysis only, along with a few lectures on subjects belonging to materia medica, pathology or practice rather than to chemistry. In many of the larger and more progressive schools this work is broadened out so as to include experimental studies in the sugars, the fats, the albumins, the processes and products of digestion and the examination of milk, blood, the gastric juice, bile, etc. There is a great diversity of opinion as to how much of this work may profitably be taught in the medical school. It is my own view that it is all out of place if it is not preceded by the proper drill in general chemistry to enable the student to really understand what he is doing. Without this clear understanding the laboratory course in physiological chemistry, which looks so well on paper, and which fills a good amount of space in the college announcement, degenerates into a mere mechanical routine, and becomes as valueless from the standpoint of discipline as is the justly condemned 'test-tube drill' in qualitative analysis. If the student is so illy prepared for his work that the operation of stirring a heated mixture of alkali solution and fat means simply 'making soap,' he might just as well spend his time in turning a grind-stone, as far as intellectual benefit is concerned. Unless he can connect this operation with many similar ones, and with the other processes of splitting fats, the experiment fails of its object. I am firmly of the opinion that the explanation of the low value placed on chemistry by many medical men may be found in the fact that in their own student days they have been forced through this kind of a routine course lacking the preliminary knowledge that would enable them to comprehend it. I maintain then that unless the student has been properly and systematically prepared in the elements of organic and inorganic chemistry, much of the matter presented to him in physiology and physiological chemistry must remain practically meaningless. As Professor Remsen well says: "It is difficult to see how, without some such general introductory study, the technical chemist and the student of medicine can comprehend what is usually put before them under the heads of applied organic chemistry and medical chemistry." (Preface to 'Organic Chemistry.') But, on the other hand, supposing that the medical student has been successfully prepared in an elementary preliminary course such as I outlined above, there is much indeed that he can really master in physiological chemistry proper. It is not necessary that he should be able to make many elaborate quantitative experiments. Most of the really important reactions in the study of the fats, the sugars and the proteids may be mastered with the aid of comparatively simple qualitative and a few volumetric tests. He will be able to demonstrate understandingly the essential facts connected with most of the digestive and other ferment changes, and to follow variations in excretion corresponding to variations in food consumption, or depending on pathological conditions. This carries the medical student as far as he is ordinarily called upon to go. Anything beyond this naturally belongs to the specialist, and besides would consume more time than can be usually spared from the medical course.

From a perusal of many of our textbooks on physiology and physiological chemistry, the student is very apt to draw erroneous conclusions as to the nature of some of the reactions in this department of science. For simplicity in didactic presentation the teacher or writer is too apt to show everything in an ideal way. A great many dogmatic assertions are made, for

example, concerning the digestion of the starches and the proteids, and the student almost expects to separate and recognize the half dozen or more beautiful products lying between corn starch and malt sugar, or the different hemis and antis, pros and paras in the still more complicated proteid family. The teacher who is not himself an investigator is but too ready to become an idealist, and to present all these intricate details in systematic tables and diagrams as he thinks they ought to be, and perhaps are, rather than as the original experimenters have actually been able to find them. The student must be warned against this, and not the least valuable function of the laboratory work in physiological chemistry in my judgment is to show him the inherent difficulties in much of our research work. An honest recognition of limitations will guard him against many future mistakes, against the preposterous analyses, for example, made by many young medical men while serving as hospital internes or in other capacity. I said a moment ago that there is much which may be easily and accurately learned in physiological chemistry by the medical student. It is evident that there is much more which in the ordinary college course cannot be mastered, and against pretended knowledge here the student cannot be too earnestly warned.

Physiological chemistry is in some institutions recognized as a distinct discipline, independent of medicine. This is true of the chair in several of the great European universities, and of at least one of the older American schools. Physiological chemistry is thus presented as is general biology or comparative anatomy. But in the great majority of cases it is looked upon as forming a part of medical rather than of general discipline, and doubtless for years to come the medical school will have many advantages in properly presenting the work. Inasmuch as no small part of the material employed in the laboratory demonstrations in the later parts of the course must be drawn from hospitals and clinics, it would seem that the effort sometimes made by other schools to give the equivalent of the medical school's work in this field must be in part futile. I am forced to the conclusion, from several practical considerations, that the student of medicine should not as a rule attempt to take physiological chemistry as a preliminary study outside the medical college. There is generally something lacking in such courses which the student recognizes often only after it is too late to recover lost ground.

Occasionally the work in physiological chemistry is given as a part of the course in physiology, but this, I believe, is a mistake, as the study is often curtailed to a consideration of a few physiological problems instead of being treated as an independent science of broad dimensions. With the present rapid expansion of this field of effort, the work calls for the attention of the specialist in chemistry rather than in physiology. This is necessarily true with respect to research study, and it is becoming equally true as regards the matter of proper didactic presentation. Much of the valuable pioneer investigation in physiological chemistry was done by physiologists, but in its later development the chemist alone can be expected to follow the accumulating mass of detail, and to sift out that which is of permanent value. It requires often rare judgment to decide how much of the newer knowledge is suitable for laboratory or class study, for no one wants to burden the already overtaxed student with a load of premature generalizations. While much of the latest work is always interesting to the specialist, it may often be quite unimportant to the student, and where to draw the proper line of separation between the new and the old calls for the teacher's maturest

judgment. This same idea should be kept in mind in estimating the value of research work for the average professional student. The training of medical students in the United States is a vastly different thing in theory and in practice both from what it is in Germany, from which land we draw so many of our ideals. We give the title of 'Doctor' to the product of our schools, but in reality we are producing *practitioners* of medicine and in the shortest possible time. The man really learned in medicine should be able to present an original research, as the German idea assumes, but the practitioner may be just as successful in actual contact with disease without this skill. I would not be understood as underestimating the value of high scientific training for medical men. Indeed in certain specialties the medical man's success depends almost wholly on his preeminent scientific knowledge acquired by long and minute study. But there is still room for the general practitioner in medicine, and in my judgment he is, and should still remain, the most useful member of the profession. The American medical school is mainly concerned in the training of men of this class rather than of those with more special knowledge, and broad culture is of more importance here than minute acquaintance with bacteriology, physiological chemistry or histology. This is an age in which we are constantly called upon to do something new, regardless of whether the new thing is really needed or not. This criticism applies to research problems in physiological chemistry given to medical students as well as it applies in any other field. It will often be found that the teacher's interests rather than those of the student receive the first consideration, and this is certainly without justification in view of what I have said about the true field of work in American schools.

The teacher who attempts the proper presentation of general and physiological chemistry in a medical school has indeed no easy task. His work is made doubly hard by the fact alluded to above, that chemistry among the older medical men is still looked upon as a comparatively useless study, and from his preceptor's office the embryo doctor often brings this notion to the medical school. To combat this idea honestly, and to put his science before the medical student as it would be presented in a scientific or general course to freshmen or sophomores, requires the full time and energy of any man, and often little room will be left for research investigation, or, what is to some more alluring, the emoluments of commercial or expert work. But the sacrifice, if indeed it may be called such, is worth the effort. There are about 25,000 medical students in the United States, and the number graduated each year is not far from 5,000, in all schools. The number of registered physicians is about 1 to 636 for the whole population. It is no small matter to be able to make the proper impression on the minds of these men, and positions as teachers in the growing medical schools of the country have been perhaps too long overlooked by the better class of chemical graduates in search of academic openings. There is a field here which is worthy of fuller cultivation.

While I have intimated above that the possibilities for research work in chemistry for the average medical student or teacher are limited, and necessarily so, I am far from underestimating such work. While it is indeed true that in many quarters a trifling research on some trivial point of wholly artificial interest may be more highly prized than is the most painstaking and successful effort in class-work, and while it is also true that the layman, or professional man of little experience as well, may often be deceived as to the real value of such efforts, it is likewise a fact

that there is always a proper appreciation of original investigation in lines of human interest. There is no more inviting field for labor of this kind than is found in the chemistry of life. The greatest problems in the scientific medicine of the future are undoubtedly chemical problems. Indeed there are no more important or inviting problems to be found in any line of study than are here presented, and the investigator will find in them enough to tax the skill and ingenuity of the most learned for years to come. This work naturally and properly belongs to the physiological chemist, and that it must be done before much further advance can be made in scientific medicine is already recognized by leading medical men. The idea was clearly presented by the Dean of the Northwestern University Medical School in the address on Medicine at the recent meeting of the American Medical Association at St. Paul, and we find it brought forward more or less emphatically elsewhere.

The chemical difference between certain of the tissues in health and disease may be very minute in some instances, but in other cases it is certainly more pronounced and capable of demonstration. This problem will unquestionably prove one of the most interesting for future investigators. We have long had considerable acquaintance with the products of renal excretion, somewhat less with the products formed or active in the stomach, and very much less with the complex reactions taking place in the lower stretches of the intestines. Investigation here is probably fully as important as in either of the other cases, but from its inherent difficulties has been but little developed. As the analysis of the urine gives us our most certain data for the diagnosis of diabetes and various renal disorders, so, it may be expected, will the rational chemical examination of the intestinal excretion prove of equal value in the exact diagnosis of other bodily ailments. There is certainly as close a connection in the one case as in the other. These questions are purely practical, and will some day claim the attention of skilled and accurate analysts.

In the field of theoretical investigations the possibilities are even greater. Almost nothing, for example, is known of the steps in nitrogenous metabolism. Between the ingested albumin and the excreted urea and uric acid is a long distance yet to be traveled by the chemical investigator; a few of the possible resting places on the way are known, but the relations of one to the other are yet extremely obscure.

Scarcely less obscure in its fundamental bearings, although seemingly less intricate, is the question of the nature and mode of action of the soluble ferments or enzymes. This is the problem of chemistry rather than of biology, as the question of the production of these substances is merely an incidental one. The epoch-marking work of Buchner in separating the active enzyme from the cells of yeast has gone far to break down the old and artificial distinction between the soluble and insoluble ferments, and to show that all these so-called vital processes are accomplished through what are essentially chemical means. It has long been supposed that in their mode of action the work of the enzyme is purely analytical, but since the interesting observations of Croft Hill on the formation of maltose from dextrose have been confirmed by O. Emmerling, who found, however, that it was isomaltose that was produced, we have opened up a new line of possible investigation which may throw light on some of the processes taking place within the animal body, where it was assumed by Liebig and others that *syntheses* do not take place.

Lately a fruitful line of investigation has been suggested by Bredig in his work on the 'inorganic ferments,' where he shows that colloidal platinum in its oxidation-

assisting behavior presents the closest analogy to some of the common organic enzymes. The colloidal metallic solutions seem to be affected by the same kinds of poisons which are known to impede the action of the soluble ferments, and to recover finally in about the same way. All these matters become of the greatest interest to the physiological chemist when we recollect that nearly all the body processes are doubtless enzymic in their character, and that the toxines or disease producers are probably chemical agents of the same class.

But it was not my intention to discuss new discoveries in chemistry. I merely wished to emphasize the fact that the fields of physical chemistry and synthetic organic chemistry are not the only ones to claim the serious thought of active investigators. I wished to suggest that the chemistry bearing on the problems of life itself presents no less interesting possibilities, and that it is worthy of more enthusiastic cultivation in our American schools. While it is doubtless true that the elementary practical instruction given in chemistry to American medical students is now equal to or possibly more systematic and thorough than that given in the majority of European schools, I wish to express the hope that in the further development of our medical colleges research work may find fuller recognition, and that in the solution of the great problems hinted at our American scholars may contribute their rightful share of effort, and in the end reap the corresponding measure of reward.

Northwestern University. J. H. Long.

SCIENTIFIC BOOKS.

Research Papers from the Kent Chemical Laboratory of Yale University. Vols. I. and II. Edited by Professor Frank Austin Gooch. New York, Charles Scribner & Sons.

The present occasion of the collected publication of these valuable papers is the coming of the two-hundredth anniversary of the founding of Yale University. The two volumes under consideration, containing an aggregate of 108 papers and 804 pages, form part of a series of Yale Bicentennial Publications. They form also a highly creditable evidence of the chemical activity in Yale College and a worthy tribute to the memory of Albert Emmet Kent, who endowed the laboratory. They cover a period of only thirteen years, the time which has elapsed since the completion of the building.

All except three of the papers included in the volume have already appeared elsewhere, chiefly in the *American Journal of Science* and the *American Chemical Journal;* and many of them have been translated into German and have been published in the *Zeitschrift für anorganische Chemie.* Hence the contents of the volume will be no surprise to chemists; the papers consist primarily either of proposals of new analytical methods or else of careful amplifications and revisions of old methods. In every case series of test-analyses are given, performed under varying conditions; hence a clear idea is afforded of the chemical error of each process. The papers cover too wide a variety of subjects to admit of detailed mention here; iodometry receives more extensive treatment than any other one subject. The value of the collection is much increased by admirably copious classified indexes.

Besides the names of the eminent director, Dr. Gooch, and his chief assistant, Dr. Browning, those of students too numerous to mention, including four ladies, are to be found at the headings of the separate papers.

The chief lack which some will feel on studying this work is the absence of frequent appeal to modern theory for assistance. As Dr. van't Hoff has pointed out, inorganic chemistry attains its greatest significance when viewed from the standpoint of modern physical chemistry. But in spite of this lack, the careful empirical investigations are so full of essential facts that no student of analytical chemistry can afford to be unfamiliar with them. The present bringing together of the scattered articles will facilitate access to these facts.

Theodore Wm. Richards.
Harvard University.

The Insect Book. A popular account of the bees, wasps, ants, grasshoppers, flies and other North American insects, exclusive of the butterflies, moths and beetles, with full life histories, tables and bibliographies. By LELAND O. HOWARD, Ph.D., Chief of the Division of Entomology, U. S. Department of Agriculture. New York, Doubleday, Page & Company. 1901.

The very complete subtitle indicates the scope of the work, and if we add that 'where possible a typical life history has been given in each family treated,' we have the leading characteristic which distinguishes it from other American works which are nominally 'popular.' Another feature of importance is that these life histories, while interestingly and entertainingly presented, are nevertheless strictly correct and scientifically accurate, in strong contrast to some other 'popular' works where vague and extravagant statements to attract the wonder-loving are relied upon to win public favor.

Dr. Howard's book, then, in its plan and in its performance stands by itself in that it makes interesting reading for him who reads merely for general information, and helps the amateur who wishes to go a little further and learn something of the classification.

But it is in this latter feature that the only notable defect in the work is found; there is no introductory chapter that familiarizes the young student with the characters referred to in the tables, nor is there any explanation of how the tables are to be used. At the bottom of page 2 the last two lines read:

"1.—Pronotum not extending back to the tegulæ 2

Pronotum extending back to tegulæ, or the latter are absent ..... 3"

But what a pronotum is, or what are tegulæ, has not been previously indicated and is nowhere clearly explained.

Of course there are other books that explain all this; but it is a question whether in a book of this expressed scope these tables in such form are of any real assistance to the owner. They could have been omitted without any loss whatever.

On the other hand, the chapter on collecting and preserving insects is in all respects admirable and exactly what is needed by the tyro whom the book may interest in the subject. The ground covered by the book is so great and the general treatment is so concise and to the point that, aside from the statement that it could scarcely be better done, little remains to be said.

A book of this kind, put out in attractive form, liberally illustrated and at a really low price ($3), will do much to create an interest in a series of insects concerning which little is generally known.

The illustrations are deserving of separate commendation. There are 264 text figures and almost without exception these are admirable. There are 48 half-tone plates, of which a fair proportion are colored, and these illustrate interestingly the limitations of this process where detail is required for identification. Nothing better has ever been done by this process and perhaps nothing better can be done. Some plates, like I. and II., are eminently satisfactory; in others, like XIV. in the same order, the majority of figures are useless for specific identification.

The book is well printed, small 4to, with xxvi + 429 pages. It contains a very complete index and a well-arranged bibliography covering the orders treated.

JOHN B SMITH.

SCIENTIFIC JOURNALS AND ARTICLES.

THE *Journal of Comparative Neurology* for September (Vol. XI., No. 2) contains, in addition to the usual reviews of literature, but one paper, entitled, 'The Neurones and Supporting Elements of the Brain of a Selachian,' by Dr. Gilbert L. Houser, of the University of Iowa, a monograph of 110 pages, with eight plates. The entire central nervous system of the common dog shark, *Mustelus*, has been examined by a variety of the best neurological methods, both new and old, and the attempt is made to give a picture of the *complete* neurones characteristic of each important region of the brain. So far as this can be attained by the methods of Weigert, Golgi, Nissl and Haidenhain, among others, it has been quite successfully accomplished, and thus an important ad-

dition is made to our knowledge of a critical phylogenetic stage of the vertebrate nervous system. The supporting elements have been subjected to the same careful study. The phylogenetic point of view has been before the author throughout, and interesting general conclusions are suggested in connection with the various encephalic regions, notably, the problems of nerve components, the phylogeny of the cerebellum, Reissner's fiber and its associated mechanism for direct motor reflexes between the optic tectum and the body musculature, and the forebrain.

The Popular Science Monthly for September has for frontispiece a portrait of Charles Sedgwick Minot, President of the American Association, and a brief sketch of his life is to be found in 'The Progress of Science.' In the first article, 'The Greatest Biological Station in the World,' W. A. Herdman describes the Naples Station and its work in a most interesting manner, and no one could be found better capable of speaking authoritatively on the subject of zoological stations. C. K. Edmunds gives a sketch of 'Henry Cavendish,' that remarkable character known as the Newton of Chemistry, and Havelock Ellis gives the summary and conclusions of the 'Study of British Genius,' leaning towards Aristotle's dictum that 'no great genius is without some mixture of insanity.' C. B. Davenport presents a paper on the 'Statistical Study of Evolution,' the quantitative method in scientific study being one to which he has given marked attention. Robert Koch's address before the British Congress on Tuberculosis on 'The Combating of Tuberculosis' is not only very interesting but very encouraging in exhibiting the methods by which consumption may be checked. John T. Duffield describes the various steps in 'The Discovery of the Law of Gravitation,' and Byron D. Halstead discusses 'Plants as Water Carriers' and, after noting the mechanism by which this is performed, concludes that back of this is a vital force that has not been reduced to a physical or chemical basis. Edwin O. Jordan considers 'The Soluble Ferments or Enzymes,' stating that they simply influence the rate of change in any substance and do not cause the change itself. In 'The Progress of Science' is a most interesting note on Vitrified Silica.

The American Naturalist for August begins with a detailed description of 'The Texan Kœnenia,' by Augusta Rucker, who shows this peculiar arachnid to be distinct from the Sicilian species and names it *K. wheeleri*. Outram Bangs gives an account of 'Mammals Collected in San Miguel Island, Panama, by W. W. Brown, Jr.,' giving a list of twelve species, six of which are new and here named and described. Gary N. Calkins tells of 'Some Protozoa of especial Interest from Van Cortlandt Park,' giving a considerable amount of information regarding their habits, and Frank C. Baker discusses 'The Molluscan Fauna of the Genesee River,' showing the influence upon this of the falls of the Genesee at Rochester. Harold S. Conant describes 'The Conchometer,' a simple instrument for measuring the apical angle and length of gasteropod shells. The sixteenth part of 'Synopses of North American Invertebrates' treats of the Phalangidæ and is by Nathan Banks, and H. L. Osborn presents some 'Variation Notes.'

The Plant World for July contains, besides a number of notes and short articles, 'The Dragon Tree of Orotava,' by Alice Carter Cook, with a fine plate of one of these curious trees, supposed to be 4,000 years old, at Teneriffe; 'Our Puffballs,' by C. L. Shear; 'A March Day's Flowers,' by Charles E. Jenney, and a biographical sketch of 'Thomas Conrad Porter,' by A. A. Heller. The supplement, 'The Families of Flowering Plants,' by Charles Louis Pollard, discusses various families of the Geminales.

The Museum Journal (of Great Britain) for August contains a report of the Edinburgh meeting of the Museums Association and prints one of the papers read there, on 'The Smallest Museum,' by Kate M. Hall. The other papers presented will appear later. The announcement is made of 'The Gift of the Horniman Museum to the London County Council.' The balance of the number is occupied with notes from various museums.

A NEW journal, entitled *Beiträge zur Chemischen Physiologie u. Pathologie*, has been estab-

lished in Strassburg under the editorship of Professor F. Hofmeister. It is to be published by F. Vieweg & Son, of Braunschweig. Twelve numbers will form a volume, to cost fifteen marks.

ACADEMIES AND SOCIETIES.

THE SUMMER MEETING AND COLLOQUIUM OF THE AMERICAN MATHEMATICAL SOCIETY.

THE Eighth Summer Meeting of the American Mathematical Society was held at Cornell University, Ithaca, N. Y., on Monday and Tuesday, August 19–20, 1901. The Third Colloquium of the Society opened on Wednesday, August 20, and extended through the remainder of the week.

About sixty persons, including forty-five members of the Society, were in attendance during the four sessions of the summer meeting. The president of the society, Professor Eliakim Hastings Moore, occupied the chair. An address of welcome by Professor L. A. Wait, representing the University, was the forerunner of a most generous hospitality extended by the University and its individual officers. Formal resolutions adopted by the Society at the close of the meeting express in part its sense of appreciation of this cordial reception.

At the meeting of the council, Dr. E. R. Hedrick, of Yale University, and Mr. S. W. Reaves, of Michigan Military Academy, were elected to membership in the Society. Twelve applications for membership were received. A committee was appointed to prepare a list of nominations of officers for the coming year.

The entire time of the four sessions barely sufficed for the presentation and brief discussion of the long list of papers. Owing to various circumstances, only two days could be devoted to the meeting, while three would not have been excessive. At future summer meetings more time must be provided. Probably the annual meeting in December will also be extended to cover two days.

The following papers were presented:

1. PROFESSOR MAXIME BÔCHER: 'On certain pairs of transcendental functions whose roots separate each other.'

2. DR. J. I. HUTCHINSON: 'On a class of automorphic functions.'

3. PROFESSOR A. PRINGSHEIM: 'Ueber den Goursat'schen Beweis des Cauchy'schen Integralsatzes.'

4. PROFESSOR A. PRINGSHEIM: 'Ueber die Anwendung der Cauchy'schen Multiplicationsregel auf bedingt convergente oder divergente Reihen.'

5. MR. W. B. FORD: 'On the expression of Bessel functions in terms of the trigonometric functions.'

6. PROFESSOR E. H. MOORE: 'On the theory of improper definite integrals.'

7. PROFESSOR OSKAR BOLZA: 'New proof of a theorem of Osgood in the calculus of variations.'

8. DR. G. A. BLISS: 'The problem of the calculus of variations when the end point is variable.'

9. DR. J. C. FIELDS: 'On certain relations existing between the branch points and the double points of an algebraic curve.'

10. DR. J. C. FIELDS: 'The Riemann-Roch theorem, and the independence of the conditions of adjointness in the case of a curve for which the tangents at the multiple points are distinct from one another.'

11. PROFESSOR E. B. VAN VLECK: 'A proof of the convergence of the Gaussian continued fraction

$$\frac{F(a, \beta+1, \gamma+1, x)'}{F(a, \beta, \gamma, X)}.$$

12. PROFESSOR T. E. MCKINNEY: 'Some new kinds of continued fractions.'

13. PROFESSOR E. D. ROE: 'Note on symmetric functions.'

14. DR. G. A. MILLER: 'Groups defined by the orders of two generators and the order of their product.'

15. DR. H. F. STECKER: 'On the determination of surfaces capable of conformal representation upon the plane so that the geodetic lines shall be represented by a prescribed system of plane curves.'

16. MR. C. N. HASKINS: 'On the invariants of quadratic differential forms.'

17. DR. EDWARD KASNER: 'The cogredient and digredient theories of double binary forms.'

18. PROFESSOR MAXIME BÔCHER: 'On Wronskians of functions of a real variable.'

19. MR. F. G. RADELFINGER: 'The analytical representation of a multiform function in the domain of an isolated singular point.'

20. DR. VIRGIL SNYDER: 'On the forms of unicursal sextic scrolls with a multiple linear directrix and one double line.'

21. DR. H. F. STECKER: 'Concerning the osculating plane of m-fold space filling curves of the Hilbert-Moore type.'

22. DR. H. F. STECKER: 'On non-euclidean properties of plane cubics and of their first and second polars.'

23. PROFESSOR L. E. DICKSON: 'Theory of linear groups in an arbitrary field.'

24. Mr. H. L. Rietz: 'On primitive groups of odd composite order.'

25. Miss I. M. Schottenfels: 'On the non-isomorphism of two simple groups of order 8!/2.'

26. Professor L. W. Dowling: 'On the generation of plane curves, of any order higher than four, with four double points.'

27. Professor L. E. Dickson: 'The configuration of the 27 lines on a cubic surface and the 28 bitangents to a quartic curve.'

28. Professor E. H. Moore: 'Concerning the second mean value theorem of the integral calculus.'

29. Dr. I. E. Rabinovitsch: 'The application of circulants to the solution of algebraic equations.'

30. M. Emile Lemoine: 'Note sur la construction approchée de π de Mr. George Peirce.'

31. Dr. C. W. McG. Black:

32. Professor Alexander Pell: 'Some remarks on surfaces where first and second fundamental forms are the second and first respectively of another surface.'

At the Colloquium, which was attended by twenty-three persons, two courses of four lectures each were presented:

Professor Oskar Bolza: 'The simplest types of problems in the calculus of variations.'

Professor E. W. Brown: 'Modern methods of treating dynamical problems, and in particular the problem of three bodies.

It is hoped that these lectures may be published in complete form. A summary of them will appear in the *Bulletin*.

The next meeting of the Society will be held in New York, on Saturday, October 26.

F. N. Cole,
Secretary.

PALEONTOLOGICAL NOTES.

VERTEBRATES FROM THE TRIAS OF ARIZONA.

As recently noted in Science, Mr. Barnum Brown was engaged during May and June of this year in making collections for the U. S. National Museum from the Trias of Arizona. The exploration was undertaken in the hope of obtaining ancestral forms of the Stegosaurs, and while unfortunately this hope was not realized much interesting material was obtained, although, like most Triassic specimens, in a very fragmentary condition. A large share of this represents the large Belodont from the Trias of Utah, described by the writer under the name of *Heterodontosuchus ganei*, and comprises fragments of the skull, numerous dermal plates, many vertebræ, all badly broken, and portions of the pelvis and limbs, besides an absolutely complete humerus, ulna and scapula. That this last bone should have escaped destruction, while others far more solid were shattered and scattered beyond redemption, is one of the many puzzling facts that come under the notice of paleontologists. Associated with the Belodont are some bones of a Dinosaur, and as a few teeth referable to the genus *Palæoctonus* of Cope are present they also probably belong to that genus. A humerus has the deltoid and other muscular ridges remarkably well developed, indicating a reptile of the strength and agility that one might expect from the owner of such teeth; it is nearly solid and smaller than might have been expected from the size of the teeth.

In a bed of conglomerate Mr. Brown obtained a number of more or less fragmentary bones, which from the shape of some associated scutes apparently belong to Cope's *Episcoposaurus*. These specimens, and the clayey matrix containing them, are unluckily thoroughly permeated with alkali, which will make their preparation, or even preservation, a matter of difficulty.

Perhaps the most interesting of the specimens are the deeply sculptured ventral plates of some extremely large Labyrinthodont. The interclavicle, which is complete, is 40 cm. long, and 30 cm. broad, 16 by 12 inches, about the size of the corresponding bone in the European *Mastodonsaurus*. It may be of interest to note that when in Washington this spring Dr. Eberhard Fraas identified a fragment of a cranial plate from the same locality as the above as belonging to this genus.

It will be seen that all the species obtained are typically Triassic, the Belodont and *Mastodonsaurus* preeminently so.

F. A. Lucas.

THE APPROACHING MEETING OF THE BRITISH ASSOCIATION.

The British Association—for so it is universally called in Great Britain without any further specification, a testimony to its supremacy among associations—meets at Glasgow on Sep-

tember 11, and a comparison of its work with that of our own Association may be of use. As a rule the addresses of the president and of the presidents of the sections are better suited to their purpose than those of our own officers, although this year there is no reason to avoid a comparison. Indeed it seems evident that in recent years the general addresses before our Association have improved both in substance and in form, being addressed to a wide audience rather than to a few specialists. In regard to the proceedings of the sections, the American Association is on the whole the leader. There are usually at the British Association several eminent men of science, who take a prominent part in the proceedings, but the average number and average importance of the papers presented are probably less than in the case of the American Association. Thus at Denver over two hundred papers were presented; and their quality will compare favorably with those that will be presented at Glasgow. The social entertainments and excursions of the British Association are usually superior to ours. Owing to the interest taken in science by the upper classes in Great Britain, it receives a more marked social recognition than is the case in this country. This, however, is not a matter of great importance; and the British Association has doubtless never been entertained more generously than was the American Association at Denver. The British Association is certainly fortunate in securing the support of a large body of members, especially of annual members. Thus three previous meetings have been held at Glasgow. In 1840, there were in attendance 1,393 members; in 1855, 2,159, and in 1876, 2,800. These members were, however, chiefly local citizens who took an interest in science, attended the meetings and subscribed $5 to support the Association. On the other hand, the American Association has a much larger proportion of scientific men in attendance; and the British Association has certainly never had an accession of nearly 1,200 permanent members, chiefly scientific men, in the course of a year, as has occurred with the American Association during the past year.

At the meeting of the British Association that opens next week, Professor A. W. Rücker, the eminent physicist, recently elected to the presidency of the University of London, will preside and will deliver the inaugural address. The public lectures will be by Professor W. Ramsay, who has chosen as his subject 'The Inert Constituents of the Atmosphere,' and by Professor Francis Darwin on the 'Movements of Plants.'

The addresses of the presidents of the sections, for the preliminary announcement of which we are indebted to a forecast printed in the London *Times*, are as follows: In Section A (Mathematical and Physical Science), the president, Major P. A. MacMahon, will first give an account of the Mathematical Society of Spitalfields, 1717–1845; and, after some remarks upon the present state of mathematics and physics in Great Britain and the teaching of those subjects, will conclude by considering the work of a specialist in science and especially of a mathematical specialist, in relation to the general advance of scientific knowledge. The title of the address which will be delivered by Professor Percy Frankland, F.R.S., president of Section B (Chemistry), is 'The position of British chemistry at the dawn of the twentieth century.' He proposes drawing attention to the factors which have been instrumental in promoting the growing activity in original investigation during the past 20 years. Coming to the present time he will point out the disadvantages under which students of chemistry labor at the universities, and will indicate some of the more important reforms which he considers desirable in the immediate future. The president of Section C (Geology) is Mr. John Horne, of the Geological Survey Office, Edinburgh, who has chosen as the subject of his address, 'Recent advances in Scottish geology.' He proposes to review the progress of Scottish geological work since the last meeting of the Association in Glasgow. In Section D (Zoology), Professor J. Cossar Ewart will probably take the opportunity afforded him in his presidential address of summarizing the results of the long series of experiments he has been carrying out at Pennycuik in connection with the subject of inheritance and telegony. Dr. Hugh Robert Mill is the president of Section E (Geography), and in his address will deal

with research in geographic science. He will argue that geography deals with the forms of the crust of the earth and the influence which these forms exert on everything free to move on the surface. In his presidential address to Section F (Economic Science and Statistics) Sir Robert Giffen proposes to discuss the increase in population during the last 100 years in the chief European countries, in the United States, and in the English-speaking colonies. Among the topics referred to will be the changes in the relative position of European States to each other and to the United States in consequence of the differences in the increase of their population; the increasing dependence of other European countries besides the United Kingdom on supplies of food imported over sea, and the question whether changes in the rate of growth of population in recent years are likely to modify in a material degree the present relative development of the countries in question. Section G (Engineering) will be presided over by Colonel R. E. Crompton, who will first deal with the probable future development of passenger and goods transport as affecting railways, tramways and ordinary roads, and will then touch on the standardizing of parts of machines to facilitate manufacture, concluding with a consideration of the National Physical Laboratory.

In Section H (Anthropology) Professor D. J. Cunningham, F.R.S., of Trinity College, Dublin, will devote his address to a consideration of the part which the brain has played in the evolution of man, especially the structural changes in the brain which have rendered the associated movements required for articulate speech possible, and to arguing that the acquisition of speech has afforded the chief stimulus to the general development of the brain. In his presidential address to Section I (Physiology), Professor McKendrick will briefly pass in review the advance in our knowledge in this branch of science during the past quarter of a century; and he then proposes to discuss some of the problems of what may be called molecular physiology, more especially the question of how many organic molecules may be contained in the smallest particle of living matter, and whether in the ovum, for example, there is a sufficient number of molecules to account for the facts of hereditary transmission. Professor I. Bayley Balfour is president of Section K (Botany). He will deal in his address with the construction of flowering plants, with the intention of showing that they owe their position as the dominant vegetation of the present epoch to their having solved best the problem of adequate water-carriage. The new Section L (Educational Science) is under the presidency of Sir John Gorst. The subject of his address has not been announced.

SCIENTIFIC NOTES AND NEWS.

THE Reale Accademia de Lincei of Rome has elected the following foreign members: Emile Picard, professor of higher algebra at the Sorbonne; Edward C. Pickering, director of the Harvard College Observatory; Samuel P. Langley, secretary of the Smithsonian Institution; J. H. Van't Hoff, professor of general chemistry in the University of Berlin; Heinrich Karl Rosenbusch, director of the Mineralogical and Geological Institute of the University of Heidelburg; Charles D. Walcott, director of the U. S. Geological Survey; Theodor Engelmann, of the Imperial Board of Health at Berlin; and Charles Richet, professor of physiology at the University of Paris.

ON the application of the Government of Victoria, Australia, for a director of agriculture, officers of the U. S. Department of Agriculture have recommended Professor B. T. Galloway, chief of the Bureau of Plant Industry, and Professor Willett M. Hays, agriculturist of the Minnesota Experiment Station.

DR. SANTOS FERNANDEZ, president of the third Pan American Congress held recently at Havana, has been presented by the members of the medical profession in that city with a gold medal in recognition of his efforts to advance medical science in Cuba.

THE Alverenga prize of the College of Physicians and Surgeons of Philadelphia has been awarded to Dr. George W. Crile, of Cleveland, Ohio, for his essay entitled 'an experimental and clinical research into certain problems relating to surgical operations.

THE Belgian government has awarded its an-

nual prize of 5,000 francs for the best work in the province of medical research to Dr. A. van Gehuchten, professor of systematic anatomy in the University of Löwen, for his researches on the human brain and spinal cord.

DR. WILLIAM HUNTER has been appointed assistant director of the Pathological Institute of the London Hospital.

As we have already announced Dr. David Starr Jordan, president of Stanford University, Dr. Barton W. Evermann, ichthyologist of the U. S. Fish Commission, and Dr. W. H. Ashmead, of the U. S. National Museum, who spent the summer in the Hawaiian Islands investigating on behalf of the U. S. Government the fishes and other aquatic resources of the Islands, returned to the United States early in August. The other members of the party will return in September, except Messrs. L. E. Goldsborough and George Sindo, who will go to Pago Pago in the Samoan Islands to make a collection of the fishes found there. The investigations proved very successful. The fishery methods, laws and statistics were carefully studied and large and important collections of the fishes were made. Upwards of 300 species were obtained, among which are many species new to science. Drs. Jordan and Evermann will soon submit a preliminary report to the Commissioner of Fish and Fisheries. The final report will not be made until more deep-sea work has been done about the islands.

MR. JOHN HYDE, statistician of the Department of Agriculture, has returned from Europe where he went to arrange with the agricultural bureaus of the leading countries for an interchange of crop reports by cable. His negotiations were successful and the plan will be in working order next year. He also investigated European methods of crop reporting, but found that they were less advanced than our own.

MR. PERCY WILSON, attached to Professor Todd's Eclipse Expedition to the East Indies, returned to the New York Botanical Garden on August 18, bringing a large collection of vegetable products for permanent exhibition from Singkep, Riouw, Malacca, Siam, Batavia, and the botanical gardens of Buitenzorg and Singapore. Mr. Wilson has been absent with the expedition since March 2.

REUTER'S Agency states that a cablegram has been received by the Liverpool School of Tropical Medicine from Sierra Leone announcing that Major Ronald Ross is returning to England by the steamship *Phillippeville*, which was due to leave Sierra Leone on August 18. He is returning temporarily for the purpose of arranging for the despatch of an expedition, similar to that now under his charge, to the Gambia and the Gold Coast. In Major Ross's absence the work of the expedition in Sierra Leone is proceeding under the charge of the other medical men. During his present visit to the West Coast, Major Ross has been to the Gambia, Sierra Leone, the Gold Coast and Lagos.

M. A. TOURNOUËR has undertaken an expedition to Patagonia, under the auspices of the French minister of public instruction, with the purpose of continuing his researches on the tertiary mammals of South America.

A MEETING in memory of the late Professor Joseph Le Conte was held by the faculty and students of the University of California on August 21. The exercises were opened by President Wheeler, and speeches were made on behalf of the alumni by Dr. William E. Ritter, professor of zoology, and on behalf of the students by Ralph T. Fisher, former president of the Associated Students of the University of California. The College of Social Science was represented by Professor Irving Stringham, and Professor J. M. Stillman, of Stanford University, spoke as a former pupil of Professor Le Conte's. The closing address was by the Hon. Horace Davis, former president of the University of California, whose concluding words were:

> The power of such a life is hard to estimate. For thirty years his name has been a tower of strength to the University, not simply for his scientific fame and intellectual attainments, but even more for his moral strength and beauty. His life has been woven into thousands of young expanding lives in this western commonwealth, and his cheerful hopes have lighted up their homes. The power of such a life cannot be estimated. You have felt it. I have felt it, and the world is better that he has lived.

Professor Edward R. Taylor then read an original sonnet entitled 'Le Conte and the Yosemite,' and the proceedings were brought to a close with selections of instrumental and choral music.

THE bust of Dr. G. Armauer Hansen, the discoverer of the bacillus of leprosy, was unveiled by Professor Visdal in the garden of the Museum at Bergen on August 10. The chief address was made by Professor Oskar Lassar, of the University of Berlin. Congratulatory addresses were received from all parts of the world, and the decoration of Commander of the Order of Ola was conferred on Dr. Hansen by the king of Norway. Dr. Hansen celebrated his sixtieth birthday on July 29.

IT is announced in *Nature* that it has been decided to erect in Leoben, Austria, a statue of Peter Ritter von Tunner, who died on June 8, 1897, to commemorate his great services to the metallurgy of iron. A committee has been formed, with Mr. Ignaz Prandstetter as president, Professor J. G. von Ehrenwerth as vice-president and Professor Carl Fritz as honorary secretary, to collect subscriptions. At a recent meeting of the council of the British Iron and Steel Institute the matter was considered. As a contribution to the memorial could not be voted from the funds of the Institute, the members of council present decided to contribute two guineas each, and Mr. Bennett H. Brough, the secretary, has forwarded to the committee in Leoben contributions amounting to about $230.

The British Medical Journal states that for the celebration of the eightieth birthday of Professor Virchow on October 13, a committee has been chosen for Switzerland, consisting of Professor Kocher, of Berne, representing the Swiss medical commission, Professor von Carenville, of Lausanne, who represents the Medical Society of French Switzerland, Dr. Haffter, of Frauenfield, representing the Central Medical Society, and Dr. Reali, of Lugano, representing the Medical Society of Italian Switzerland. Professor Skliffasowski having been incapacitated by illness, Professor Tarantzki, head of the Medical Academy of St. Petersburg, has been chosen president of the Russian committee in his place.

AMONG the numerous greetings from all parts of the world addressed to Professor Süss, the eminent Australian geologist, paleontologist, and politician, on the occasion of his seventieth birthday, says the London *Times*, is one from the Geological Society in London. He was elected a foreign correspondent of the Society in 1863 and foreign member in 1876, while 20 years later it bestowed upon him its highest geological distinction, the Wollaston medal. The telegraphic congratulation of the Society concludes as follows: "Universally regarded here as the greatest living geologist, whose epoch-making work will bear fruit in the field of science for generations to come. Warmest congratulations and best wishes from British colleagues." To his own countrymen Professor Süss has been not only a distinguished pioneer in science. He has been an example of enlightened patriotism and devotion to the public welfare and an indefatigable reformer, whose works will remain a monument to his memcry.

DR. THOMAS MASTERS MARKOE, the eminent surgeon, died on August 27, aged eighty-two years. Since 1860, Dr. Markoe had been connected with the College of Physicians and Surgeons of Columbia University as adjunct professor and professor of surgery and later as professor of the principles of surgery.

MR. ALBERT NELSON CHENEY, fish culturist of New York State, died at his home in Glen's Falls, N. Y., on August 18, aged about fifty years. He was the author of many contributions on pisiculture.

THE death is announced of Dr. Leroy Méricourt at the age of seventy-five years. Dr. Méricourt is known as one of the reorganizers of the French naval medical service and for his writings upon tropical medicine and hygiene. He was a chevalier of the Legion of Honor, a member of the Academy of Medicine and one of the founders of the *Archives de médicine navale*.

MR. ANDREW CARNEGIE has given £7,500 to Rutherglen, Lanarkshire, Scotland, for a public library and £10,000 to Motherwell, Lanarkshire, for a town hall. Gifts for libraries, under the usual conditions, of $25,000 and $37,000 are reported from Beloit, Wis., and Moline, Ill., respectively.

ACCORDING to the N. Y. *Medical News* a systematic plan for the extermination of mosquitoes has been inaugurated by the residents on the north shore of Long Island from Rosyln to Huntingdon. The immediate work to be undertaken will be in charge of Messrs. A. C. Weeks and F. E. Lutz, of the University of Chicago, who will work in conjunction with Dr. Chas. B. Davenport, director of the Biological Laboratory of Cold Spring Harbor.

IT has been decided that the commission to be sent out by the Liverpool, Manchester and London Chambers of Commerce to investigate the conditions of health and sanitation in West Africa shall consist of one member from each of the three chambers of commerce and of a sanitary engineer. In addition, Major Ronald Ross has been requested to attach himself to the commission as expert in tropical medicine.

WE learn from the *Lancet* that legal authority has been given for the creation of a fund for scientific research in France. It is divided into two sections, and its object is the promotion of purely scientific work relative (1) to the discovery of new methods of treatment of the diseases which attack man, domestic animals, and cultivated plants; and (2) to the discovery, apart from the medical sciences, of the laws which govern natural phenomena (mechanics, astronomy, natural history, physics and chemistry). The income of the fund will be derived from the following sources: (1) Grants made by the government, by the departments, by the communes, by the colonies, and by other sections of the population. (2) Gifts and bequests. (3) Individual or collective subscriptions. (4) Grants deducted from the proceeds of the *pari-mutuel* assigned to philanthropic or charitable purposes locally; the annual amounts of these grants, which will not be less than 125,000 francs, will be fixed each year on the application of the council of management by the special commission held at the Ministry of Agriculture. (5) Interest of money invested in government securities or deposited with the treasury. The fund is subject to the authority of Ministry of Public Instruction, and is managed by a council assisted by a technical commission concerned with the grants.

Nature states that a committee has been appointed by the president of the Board of Trade to inquire and report as to the best means by which the state or local authorities can assist scientific research as applied to problems affecting the fisheries of Great Britain and Ireland. The members of the committee are as follows: The Right Hon. Sir Herbert Maxwell, Bart; Mr. Walter E. Archer, Mr. Donald Crawford, Rev. William Spotswood Green, Professor William Abbott Herdman, the Hon. Thomas H. W. Pelham, Mr. Stephen E. Spring-Rice, C.B., and Professor J. Arthur Thomson.

THE daily papers report the death from yellow fever of two men and one woman who permitted themselves to be bitten by infected mosquitoes in order to become immune. It should be understood that the trials were not made in order to test the communication of yellow fever by mosquitoes, but they are certainly very convincing evidence. It is further reported that the yellow fever commission regards the experiments with the Caldas serum as having demonstrated its uselessness and will not supervise any further experiments conducted by Dr. Caldas.

THE *Lancet* states that the proposal to establish a central pathological laboratory in connection with the lunatic asylums of Ireland has taken practical shape by the insertion of a permissive clause in the lunacy bill which has just passed. According to it the committees of any two or more district asylums may, with the consent of the county council, agree to unite 'in providing and maintaining a laboratory for pathological research in connection with insanity and nervous diseases,' and the committees of those institutions may defray the expenses incurred.

A GOVERNMENT laboratory for experimenting with explosives is to be built at Sandy Hook at a cost of $10,000.

REUTER'S Agency announces that the expedition under Captain Stoekken arrived at Christiania on August 17, after having explored the south coast of Franz Josef Land. The expedition found no trace of the three lost members of the Duke of the Abruzzi's expedition. The memorial presented by the Duke was erected on Cape Flora.

According to the daily papers the steamer *Frithjof* arrived at Hammerfest on August 29 and reported that the Baldwin-Ziegler arctic expedition had been landed at Camp Ziegler, in latitude 90.24° north and longitude 55.52° east, on Alger Island. All the members of the expedition were in good health. Mr. Baldwin intended to start northward on August 24, by the interchannel route, across Markham Sound. We record the movements of this arctic expedition with some hesitation, as it has but little claim to be called scientific. Mr. Baldwin contributes to the last number of *McClure's Magazine* what is said to be the only authorized account of the aims of the expedition. He enlarges on his intention to reach the pole and describes in detail the number of tons of provisions of different kinds provided by the liberality of Mr. Ziegler, but does not mention the names of the members of the scientific staff. Still valuable scientific knowledge may be secured, and even voyages of adventure have some relation to the advancement of science.

The Italian government has established laboratories of micrography and bacteriology and chemistry as dependencies of the Sanitary Bureau. According to the *British Medical Journal* a department of the bacteriological laboratory is to be devoted to the preparation and control of serums and similar products. The professional staff of the bacteriological laboratory consists of a director, with a salary of $1,200; a coadjutor, with $800; and two assistants, with $500 each. For the serum department there are medical and veterinary coadjutors, each with a salary of $800 and three assistants at $500 each. The staff of the chemical laboratory is paid on the same scale.

The National Good Roads Association of the United States has called an International Congress of Good Roads, to be held in Buffalo, September 16–21. All sessions of the congress will be held during the Pan-American Exposition. It is designed to devote a portion of the time included in the dates above named to demonstrate the scientific methods of modern road construction by building sections of the various classes of roads, including earth, oil, gravel, stone, tar-macadam, vitrified brick, etc. A railroad train equipped with modern road-making machinery will be on exhibition, and practical road experts and engineers will have charge of the work. The scope of the deliberations of the congress will include general discussion and exemplification of the science of road construction and maintenance, together with experimental tests and experience of the several countries of the world and the states of the Union. Addresses will be made by prominent statesmen and officials, competent engineers, and scientific road experts from various nations.

According to the *Medical News* several members of the Chicago Sanitary District Board are said to have suppressed the reports showing the self-purification of running streams. After having appropriated $2,500 for the preparation of the report and after having authorized its publication, they are said to have taken steps to keep it from being made public. The circumstance was brought to the surface when President Alexander J. Jones was asked to permit access to the report by several expert chemists who spent months making an examination of the waters of the drainage canal and the Illinois river. The experts are Professor E. O. Jordan, of the University of Chicago, Professors Palmer and Burrill, of the University of Illinois, and Professor Adolph Gehrmann, of the city laboratory. Political jealousy, lest the publication should reflect too much credit upon city officials, is alleged to have been the chief motive which actuated the suppression. The suggestion as to this motive comes from officials of the City Health Department. President Jones declares that the report was suppressed so that the material in it could be used by the sanitary district in its defense against the attempts of the city of St. Louis to have the drainage canal closed by the courts. Should the report become public, says President Jones, its value as a defense would be injured. The suppressed report is said to show that the waters of the drainage canal are not polluting the waters of the Illinois River and that the alarm of St. Louis is unfounded. Before the waters of the river reach Peoria they are said to be absolutely pure. At that point they are contaminated by the Peoria distilleries. The river again becomes perfectly pure many miles

north of the junction with the Mississippi River. Trustees of the sanitary district are pleased with the action of the War Department in issuing orders to allow a swift flow of water through the canal during eight hours of the day. The hours specified are between 4 p. m. and midnight, and the flow allowed is 300,000 cubic feet a minute, instead of 200,000 cubic feet, as is allowed during the remainder of the day.

THE Report on the Observatory Department of the National Physical Laboratory for the year 1900 has been published in the *Proceedings* of the Royal Society. According to an abstract in *Nature* the magnetographs have been in constant operation throughout the year, but the curves have been quite free from any large fluctuations. The mean westerly declination for the entire year was 16° 52′.7. The automatic and tabulated records of the various meteorological instruments have been transmitted, as usual, to the Meteorological Office, to be dealt with in its publications, and special cloud observations have been made each month in connection with the international scheme of balloon ascents. Seismological observations have been regularly made; two noticeable disturbances occurred during the year, on January 20 and October 29. A detailed list of the movements of the seismograph will be published in the Report of the British Association for the present year. As regards experimental work, the observation of distant objects during mist and fog and researches upon atmospheric electricity, referred to in previous reports, have been regularly continued. The list of the various instruments tested is a very long one. Some of the cases in which a considerable increase has occurred are: Aneroids and marine barometers (number tested in year 1900), 336 (increase 69); compasses, 963 (increase 559); rain gauges, 1,345 (increase 784); clinical thermometers, 20,476 (increase 4,456); total number of instruments tested, 27,569 (increase 5,518). The principal addition to the staff during the year has been the appointment of Dr. J. A. Harker as an assistant in the laboratory.

IN an interview with a representative of the London *Times*, Professor Otto Nordenskjöld, who is at present staying at Malmö in order to make arrangements for his antarctic expedition, made the following statement: "As soon as the *Antarctic* returns from the expedition which she has made to Spitzbergen for meridian measurements—and it is calculated that she must be on her homeward journey by September 15—we start from Göteborg. The time of our departure cannot, of course, be definitely fixed, for unforeseen hindrances may arise; but we shall certainly be able to weigh anchor by about October 1. From Göteborg we shall proceed to England, and thence to Buenos Ayres and Tierra del Fuego, whence we shall make our way to the antarctic regions. We shall endeavor to push as far south as possible with the *Antarctic*; and, when winter comes on, we shall send a party on shore to winter. That party will probably consist of six persons, of whom I shall be one. We shall build a small hut for ourselves, and engage in meteorological, magnetic, hydrographic and other scientific observations. As soon as we have landed, the *Antarctic* will return to Tierra del Fuego; and a scientist, who will sail with her, will conduct the researches in that hitherto little explored country. In this way we shall be able to work in two detachments, and make as much use of our time as possible. As is well known, an English and a German South Polar expedition are also being sent out at the same time. In order to avoid clashing with one another, these three expeditions have come to an agreement whereby we explore the region south of the Atlantic Ocean, the Germans that south of the Indian Ocean, and the British that south of the Pacific Ocean. Naturally we cannot advance so far towards the South as towards the North Pole, but the scientific results must be great, and we are well equipped for scientific research. I shall have some able scientists with me. Professor Ohlin, of Lund, the well-known explorer, and M. K. A. Andersson will accompany me as zoologists. Dr. Bodman will come as hydrographer and magnetician, M. Skottoberg as botanist, and Dr. E. Ekolof as medical officer. The Norwegian, Captain Larsin, who has already made several voyages to South Polar regions, will be in charge of the *Antarctic*."

A CORRESPONDENT of the London *Times* reports that a discovery of flint implements has lately

been made on the estate of the Marquis of Ailesbury at Knowle Farm, on the borders of Savernake Forest. A gravel pit was opened a short time ago close to the farm buildings, and the implements have been found at various depths, some embedded in coarse gravel and silt and others in dark red clay, at a depth in some instances of 8 feet to 10 feet from the surface. The ground is at least 450 feet above sea-level, and it would seem that at the particular place where the gravel occurs two or three streams must have met which had had their courses through the forest and were making their way to the valley of the Kennet, some three or four miles to the southeast. There is now no stream of water in any part of the forest, and besides this there is nothing to indicate in the present configuration of the ground the source from whence the water by means of which the valleys were eroded could have come. It is only by imagining an entirely different face to the country (such as might have been if the valleys had been eroded before the formation of the Pewsey Vale, some three or four miles to the southwest) that an origin for the streams in these forest valleys can be conceived. Between 200 and 300 implements have already been found, many of them of beautiful workmanship, while others are very rude and apparently unfinished. Whether these latter belong to the earlier 'Eolithic' period and have been washed out of earlier beds of gravel and deposited with implements of a later date (as appears to have taken place on the plateaus in Kent) is a point to be decided hereafter; but it is very difficult to imagine those rude implements to have been manufactured by the same race of people as have made and finished with so much care those apparently lying by their side. Most of the implements are of very superior flint, extremely hard in texture; one or two may be of chert, and one appears to be of 'Sarsen' stone, and they bear a marked similitude to those found at St. Acheul in the valley of the Somme. Many have been rolled and have lost all their sharp edges, while others appear to have been made on the spot and to have had but little use before they were embedded in the stiff clay where they are now found. Some are very finely polished, as if from the constant rubbing of blown sand, and have an appearance as if coated with glass. They are of all sizes and shapes, some from 5 in. to 6 in. long, generally of a rough, unfinished type; others 3 in. to 4 in. long, of the common spear-shaped form; others of the well-known ovoid form; and others pointed as if to be used as drills. One or two paleolithic implements have been previously found in the locality; but the occurrence of them in such large numbers as these at Knowle is quite new to the district.

UNIVERSITY AND EDUCATIONAL NEWS.

THE University of Edinburgh receives £5,000 by the will of the late Miss Eleanor Omerod, the entomologist.

THE *Educational Review*, which each year carefully compiles a black list of the institutions that offer the degree of Ph.D. *honora causa*, finds this year only two such institutions —Bethany College and Dickinson College.

DR. J. W. BASHFORD, president of the Ohio Wesleyan University, who, as we reported last week, has been offered the presidency of the Northwestern University, has decided to remain with the former institution at the urgent request of the trustees.

DR. A. W. HARRIS, president of the University of Maine, has resigned in order to accept the position of director of the Jacob Tome Institute at Fort Deposit, Md.

DR. A. P. OHLMACHER, director of the pathological laboratory of the Ohio Hospital for Epileptics at Gallipolis, Ohio, has been appointed professor of pathology in the Medical School of Northwestern University.

ALBERT HENRY YODER, A.B. (Indiana), has been appointed professor of pedagogy at Washington University.

MR. R. K. MCCLUNG has been awarded an exhibition scholarship of 1851 by McGill University. He will go to Cambridge University to study under Professor J. J. Thomson.

AT Hartley College, Southampton, Dr. J. T. Jenkins has been appointed lecturer in biology and geology, and Mr. J. D. Coates assistant lecturer in physics and electrical engineering.